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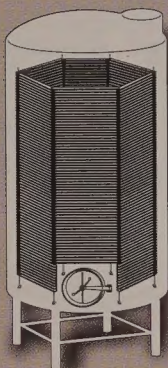
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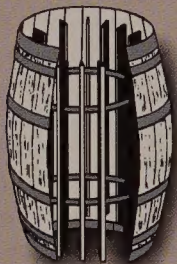
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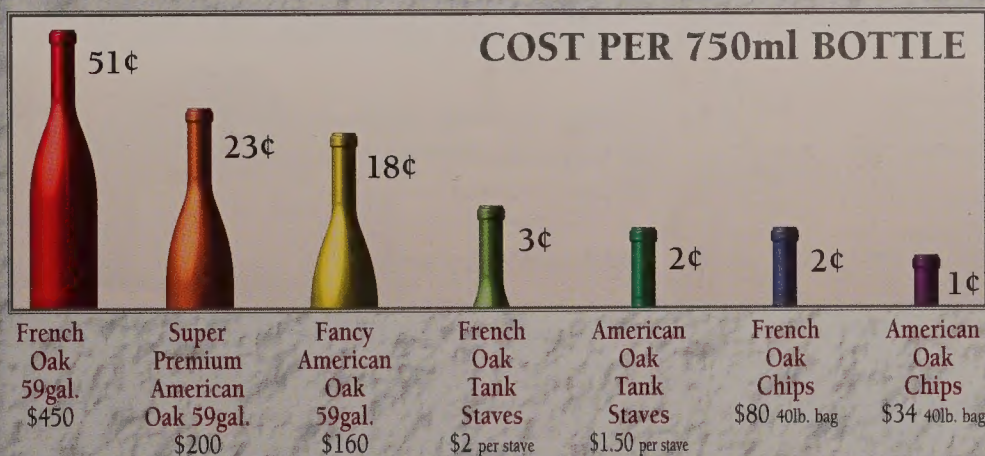
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Tied houses cannot stand

by Patrick Campbell

The 1996 wine industry crystal ball reveals several issues burning brightly: rising prices for domestic wines; renewed foreign competition; increased consumer interest in red wine in general and Merlot in particular; more wine-is-healthy-in-moderation news, and the beginning of the end of California tied-house legislation.

Tied-house legislation? On the scale of consumer concern, tied-house laws rank somewhere between Nepalese entomology and Liberian water policy. Though most wine lovers have never heard of them, tied-house laws ultimately affect what wine consumers can buy and how they can or can't buy it and from whom

they can buy it. If the distribution of all consumer goods was as strictly controlled as wine, the shop-

pers of America would rise up in arms and hold a national tea party, and soon.

Tied-house laws regulate what is known as "vertical integration": the financial interests between the producer, wholesaler, and retail distribution tiers. California's tied-house laws are codified in Chapter 15 of Division 9 of the California Business and Professions Code, and they represent some heavy reading.

Chapter 15, among other things, generally forbids a wine producer or wholesaler to own all or any part of an establishment that serves wine, beer, or spirits. Neither, it specifies, may a winemaker take out an advertisement that lets the public know what stores carry his wine; nor may he give the retailer anything that may encourage the sale of his product.

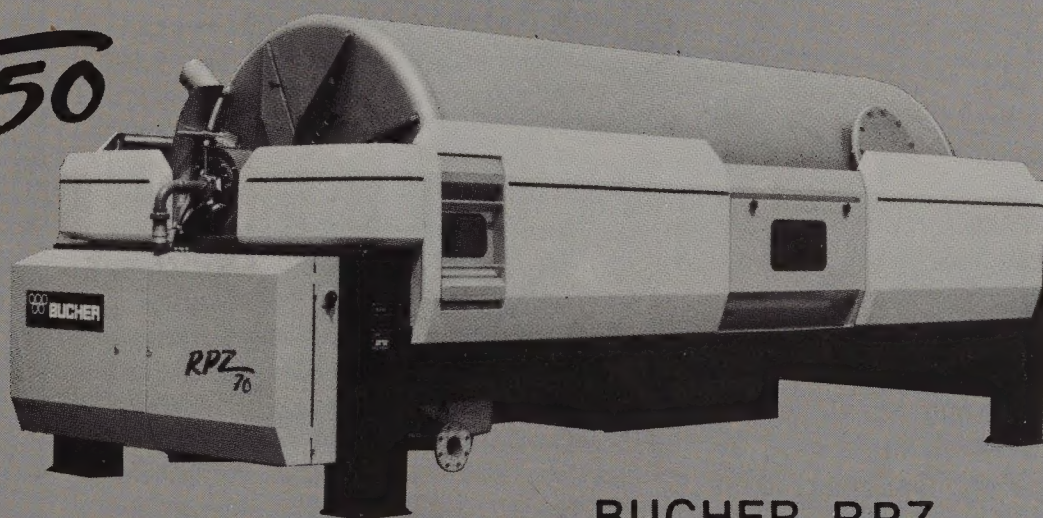
Chapter 15 is nearly as inscrutable as the IRS tax Code. And every year, it increases in verbosity. The statute filled

some two pages in 1935; it now spills over 15 pages, and has become a veritable Swiss cheese of exceptions, loopholes, and concessions to special interests. Consequently, it has become a lawyer's right to work permit and occasionally establishes a legislator's right to campaign contributions.

But why should we in the wine industry care about tied-house legislation? Simply, because this vestige of post-Prohibition era thinking is the unseen foundation upon which the separation of the three-tier distribution system is built, sanctimoniously justified, and zealously guarded, to which the macho posturing of Kentucky and Florida is but the most recent witness.

When the 21st Amendment granted to each state control of the licensed beverage trade in 1933, the world was such a profoundly different place that it is difficult to comprehend in this era of instantaneous communication, virtually unlimited consumer choice, and goods from Maine to Hawaii as freely available

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FREE RUN

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Some eight decades before the dawn of the second millen-nium, regional beer producers exercised monopolistic domination over their local markets. Not only did the breweries own their own saloons, they sold only their own beer — for consumption in-house and for off-sale — and jealously excluded all other producers. Thus the pre-Prohibition beer

sales in the U.S. amounted to a system of virtual mini-monopolies.

This was the era of the “free lunch.” Meals were offered to saloon patrons free-of-charge in the expectation that the establishment’s not-free beer would flow freely in exchange. So freely, in fact, that patrons would often leave behind their families’ weekly paycheck. Sadder but wiser, they would observe, “There is no

such thing as a free lunch.”

A national commitment after the repeal of Prohibition to avoiding a repetition of the monopolistic practices of the breweries and the social mayhem that often resulted led to tied-house legislation. If the producer were simply forbidden to own saloons, exclusionary trade practices would be discouraged and — as the preamble to Division Nine states — “safety, welfare, health, peace, and morals” would be encouraged and temperance would be promoted. Or so the thinking went.

Thus, shortly following Repeal, both federal and California laws were promulgated to ensure that alcohol beverage monopolies and enticements to public drunkenness would be abolished. But while the intent of the laws was the same, the methods were profoundly different. A brief examination of the differences is instructive.

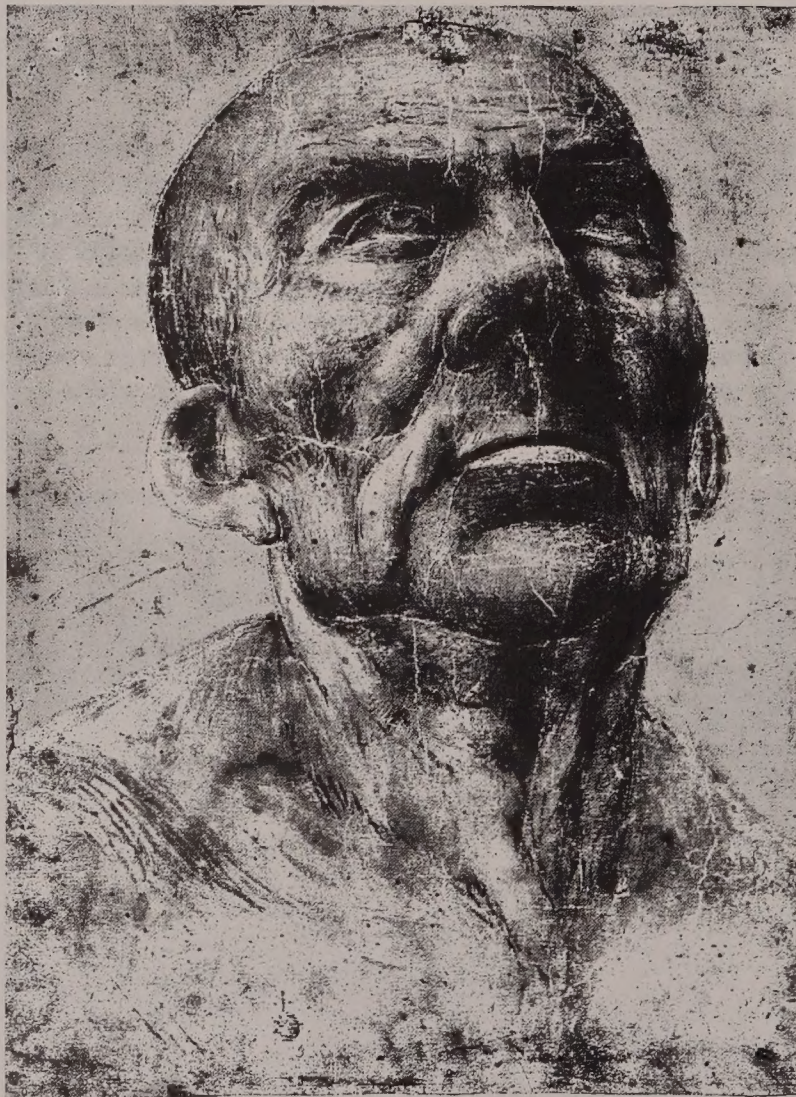
California law (Chapter 15) states that no winegrower or wholesaler “shall hold the ownership, directly or indirectly, of any interest in any on-sale license.” A winery may not own all or any part of a food service establishment. Period. Well, sort of period. That is, if you don’t count the 13 pages of exceptions, amendments, revisions, changes, and repetitions that have subsequently been added to promote the advantage of mostly well-heeled petitioners.

In contrast to the prolixity and obscurity of Chapter 15, Federal tied-house law — as contained in the Federal Alcohol Administration (FAA) Act is a mere half-page of crystal clear prose and intent. The FAA Act therein comes down squarely on the side of fair trade practices. Federal tied-house law, like Chapter 15, also prohibits cross ownership, if, but only if, such financial interest in a retail license or “giving a thing of value” to a retailer results in unfair trade practices through the exclusion of or discrimination against other brands.

In essence, California law says that because cross ownership may result in unfair trade practices by some, cross ownership must be proscribed for all. The FAA Act, in contrast, allows for cross ownership unless, and only unless, it results in unfair trade practices, in which case the force of law will be brought to bear on the offender.

A legal scholar is not required to point out that the California approach

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imposes its own form of discrimination and exclusion on producers who are *a priori* denied business relationships that actually may be in the consumer's best interests, which may in fact promote an open market place, and which are manifestly quite the opposite of discriminatory and exclusionary.

Federal law is based on the same standard that is applied to virtually every societal and commercial situation in the U.S. We Americans are, after all, innocent until proven guilty; free to lead our lives as we want unless harm to others results; and we are permitted to own automobiles (and under Federal law, restaurants), even though such ownership is potentially dangerous.

But under Chapter 15, California wine-makers may not own any establishment that serves licensed beverages: restaurants, hotels, saloons, resorts, taverns, convention centers, ball parks, theme parks, or marine parks. Unless, of course, the marine park happens to be not less than 125 acres in size and is located in San Diego County, or you own a motion picture theme park of "no less than 25 contiguous acres, located in Los Angeles County that has an annual paid attendance of at least three million people."

In other words, if you are just an ordinary wine producer, without the clout to engineer a legislative exception that suits your needs, you can forget about owning a restaurant — unless, of course, you own no more than two, and no more than 15% of the wines served are your own, and your winery sells no more than 125,000 gallons annually in California. And so on.

Somewhere between the enactment of California tied-house legislation and the end of the millennium, an interesting leap of logic occurred. Chapter 15's blanket prohibition of producer and wholesaler ownership of on-sale retail licenses evolved into a full-fledged sanctification of the separation of the three tiers of the distribution system.

In Part II, we will examine how this unwarranted extension of the intent of Chapter 15 law has ironically helped to propel the consolidation of wine distribution into fewer and ever-more-monopolistic hands, to the detriment of both an open market place and the consumer.

Has Chapter 15 become redundant? Is a return to the intent and methods of the FAA Act tied-house legislation now called for?



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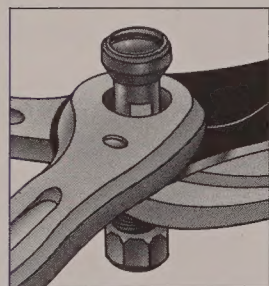
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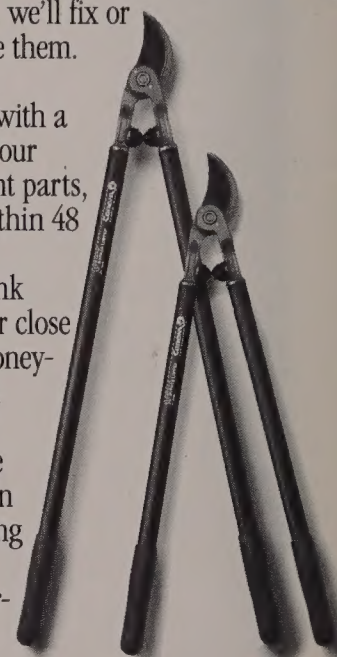
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Wine microbiology EVOLUTION

by Ralph E. Kunkee
Professor of Enology, Emeritus
Department of Viticulture & Enology
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Introduction

Let us consider the evolution of wine microbiology over the last four decades. Of course any such retrospective must begin further back in time with Louis Pasteur, for while the positive and negative actions of microbes have been the operating features of wine production forever, the basic understanding of fermentation and the possibilities of rational methods for control came only with the discoveries of Pasteur and with the publication of *Études sur le Vin*.¹⁰

Application of Pasteur's studies, especially the realization of the microbiological cause for much of the spoiled wine of that time, was important in salvaging untold volumes of spoiled wine. Furthermore, his work was the foundation on which other microbiologists, especially at the turn of the century, began to base their understanding of the ecology of "native" yeasts in vineyards, the methodology for use of single cell yeast cultures and the corresponding importance of starter cultures (both for wine and beer), and the mechanism and sources of malolactic fermentation.

Nevertheless, neither Pasteur nor his students had ready access to single cell cultures and thus were somewhat handicapped in assigning distinctive wine spoilages to specific microbes: strains, species, or genera. Nevertheless, Pasteur was able to identify microscopically the preponderate microorganisms associated with many of the "diseases" of

spoiled wines, continuing to employ many of the descriptive terms in use at the time: *acescent* (acetic), *tourné* (turned), *pousse* (pushed — the cork?), *amertume* (bitter), *filant* (ropy).

It has only been in the last several decades that the more legitimate characterization of wine diseases, now referred to as spoilages, has been insisted upon. This reformation can properly be attributed to the publication in 1955 of the review article by R.H. Vaughn on bacterial spoilage of wine.¹² In a large sense, this was the turning point — starting in California at the University of California at Davis (UCD) — and the beginning of the last several decades of the modern and fruitful investigations of wine spoilage.

Much of the work discussed here is from the doctoral theses of G.J. Pilone, R.A. Morenzoni, L. Pukrushpan, R. Singh, S. Traverso-Rueda, and J. James. Further information on, and more complete citations for materials given in this report can be found in Boulton et al.¹

The 1960s

Although *Études sur le Vin* appeared nearly 100 years before the 1960s, its early impact on enological practices was minimal in contrast to the impact on brewing. However, the excitement for the use of "pure wine yeast strains," which was begun at the turn of the century by H. Müller-Thurgau in Germany and G. Jacquemin in France, was taken up again during the 1960s in California.⁶ University endorsements for use of several pure wine yeast strains led to their commercial availability, outside of UCD, as active dry yeast.^{11,8}

At this time, most California wine was of the dessert/aperitif category. The

high (17% to 20%) ethanol of these wines greatly helped protect them from microbial spoilages. However, some strains of lactic acid bacteria, especially *Lactobacillus trichodes* (now *L. fructivorans*), were found to be resistant to this high level of ethanol. Happily, it was discovered that these organisms were sensitive to SO₂, and informed use of this disinfectant prevented susceptible wines from becoming spoiled.

At this time, microbiological research at UCD was more directly involved with malolactic fermentation: its detection, methods of control, and better understanding of its significance.^{2,4} Again, the first investigations of this as a microbial event were made at the turn of the century, but they were revisited during this decade, especially by UCD researchers R.H. Vaughn, J.L. Ingraham, and G.M. Cooke.¹

The most effective results were those which showed the importance of the malolactic fermentation with relation to premium wines, especially reds, in California. Part of this achievement was due to the development of a simplified method for detection of malolactic fermentation,³ and part due to isolation, purification, and identification of many strains of these bacteria.

One of these strains (*Leuconostoc oenos* ML34) was the first used to induce a malolactic fermentation commercially, and thus to confirm industrially Koch's hypothesis! Equally significant were the beginnings of the study of the intermediary metabolism of malolactic bacteria, showing an advantage for them in the fermentation of malic acid, even though malic acid had already been definitely shown not to be an energy source for these organisms.

An interesting aside: during the 1960s investigations began to discover the origin of unpleasant odors in some table wines (under 14% ethanol) — those being newly produced in regions and facilities of traditional fortified wines (see "1970s"). It was supposed that these off-notes were arising from malolactic bacteria, but research at UCD led to the later discoveries that the offensive flavors and odors were coming from the spoilage yeast *Brettanomyces* spp.

The 1970s

The 1970s were marked by a dra-

WINEMAKING

matic increase in American wine consumption and production, typified by a new enthusiasm for table wines (under 14% ethanol), especially white table wines, often slightly sweet and often served as aperitifs. Thus, during these years, the California wine industry not only had a spectacular doubling in production, but at the same time, went from production of about 80% dessert/aperi-

tif wine to about 80% table wine. This brought corresponding perils.

On the one hand, this increase was attractive to producers unskilled in wine production; and on the other hand, many skilled producers of dessert/aperitif wines found themselves making a completely different product. In both cases the new productions were susceptible to microbial spoilages, the facts for which

the enterprising new producers were unprepared and, in many cases, unwilling to face. Thus, eradication of microbial defects was the hallmark of this decade.

Most often this was simply the insistence of implementation of standard enological procedures: avoidance of unhealthy fruit, good sanitation procedures at the grape reception area and in the winery (during fermentation and storage), judicious use of SO₂ (during all indicated phases of production), inoculation with well-prepared starter cultures of established wine yeast strains, proper temperatures of fermentation and storage, good attention to topping regimes, use of barrels of known hygiene, thoughtfulness in the introduction of wines from outside the winery into the winery.

It was during this decade that the possibilities of *Brettanomyces* as an important spoilage yeast in California, and indeed, the difficulties in prevention of it, came to the fore.

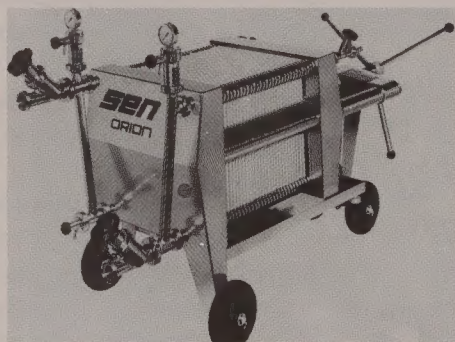
This was also the era of new methodology in sensory evaluation of wines (and foods) at UCD. The questions of what are, or what should be, spoilage odors became important topics for discussion — philosophically and commercially. But it became clear that, whether one wanted or did not want a special "spoilage" note in certain wines (wines often recognized by being expensive and foreign), that these wines could be produced by knowledgeable manufacturers very inexpensively and consistently, the consistent attribute often lacking in the mistakenly admired wines.

This decade saw an increased demand not only for lower alcohol wines, but also for semi-dry wines, those with obvious residual sugar. At this time, the standard procedure for microbiological stabilization of semi-dry wines was to use one or another of two chemical inhibitors, Baycovin or Sorbistat. Baycovin, which in many ways was considered an ideal inhibitor, was removed from wine production at this time.

Although there were some flavor difficulties with the use of Sorbistat, its bigger problem was that some wine yeasts, especially species of *Zygosaccharomyces*, were resistant to it. Thus a physical method of yeast removal — by sterile filtration followed by sterile bottling — was developed as the only viable alternative.

This decade was marked by UCD's successful encouragement of wineries to

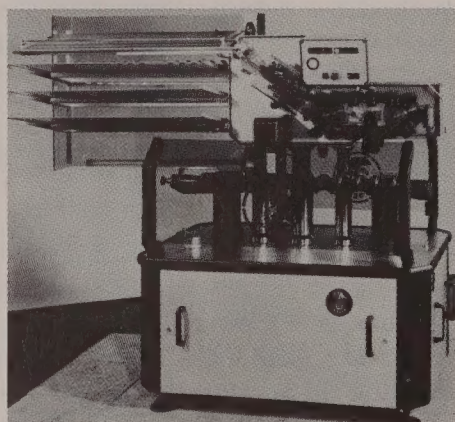
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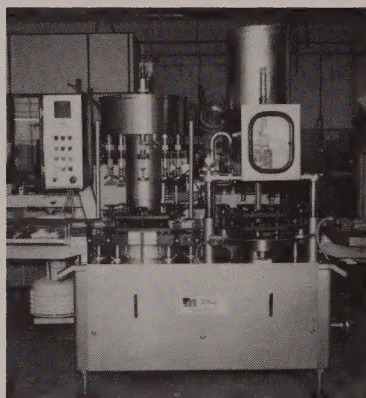
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install and use sterile filtration and bottling, ultimately making this method the method of choice.

Unfortunately, in situations where this was, and still is, deemed impractical, the problems of *Zygosaccharomyces* spoilage are still with us. This spoilage problem is essentially a cosmetic one, but commercially, this kind of defect is as serious as any other. However, later work in the 1990s would show that small volumes could be successfully sterilized by use of heat. That is, tunnel pasteurization of half-bottles, 350mL of wine or grape juice, could be rendered free from microbes without *any* change in sensory characteristics.⁹

The 1980s

Microbiological spoilage problems tended to subside during the 1980s. By this time, preventative principles were understood and preventative measures were prevalent throughout the industry. Widespread production of wines "free from microbial defects" allowed for another dimension of winemaking to be expressed.

Winemakers now became experts in the "articulation" of the grape variety. This included the choice of grape (and root) stock, the appropriate choices of vineyard and mesoclimates, and the various attributes which are often incorporated together as *terroir*, including not only the choice of soil composition and type, but also the choice of myriad viticulture practices of pesticide control, irrigation regimes, pruning, thinning, bud positioning, and leaf removal, for example.

Nevertheless, wines produced "free from microbial defects" had detractors — some oenophiles maintaining that the varietal distinctions now allowed to be so evident were no match for the missing putrefaction notes, which characterized some of the wines of their expectations. Happily, the "science" of winemaking allows for production of whatever wine the winemaker's "art" demands.

Some of the other, nonspoilage, microbiological investigations during this decade had to do with evaluation of wine yeast strains with respect to flavor affects (or lack thereof), to control of fusel oil formation, to mechanisms of resistance to ethanol, to continuous fermentation under high pressure, and to insertion of the malolactic gene from a lactic acid bacterium.¹³ Also, the earlier investigations into the malolactic fermentation (see above), giving the

criteria for the most desirable bacterial strains, enabled the commercial availability of starter cultures for inducing this fermentation.^{7,1}

The 1990s

The previous decades had allowed production of wine without microbial defects and wines with great attention paid to the expression of varietal charac-

ter. This, along with the modern understanding of enological principles, set the stage for the ultimate in wine crafting — development of individual styles or the expression of the winery's *typicité*.

These exciting new modes included exploitation of unusual yeast and bacteria strains, innovative maceration and fermentation regimes, imaginative *sur lies* treatments, and other storage practices. In

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some cases, unfortunately, this new birth of freedom also licensed ignorance of well-established microbial practices, outlined in "The 1960s" section above. Naturally this brought the return of many of the supposedly vanished spoilages.

Lack of attention to good enological practices is not necessarily a local phenomenon. The spoilage of high alcohol wines mentioned above ("The 1960s") by resistant *lactobacilli* has recently reappeared in some of the Port wines of Portugal — for the same reason.

In California, some new microbial spoilages have also reared their ugly heads. The "innovative" fermentation regimes of maceration of crushed red musts, without SO₂ and without added yeast, has brought about, in some cases, a rapid bloom, which we named "ferocious *lactobacilli*." This growth is so ferocious that within a day or two, the production of acetic acid (not ethyl acetate) can be above legal concentrations and enough to prevent the continued fermentation by *Saccharomyces* wine yeast. Invariably this has happened when the

starting pH has been above 3.5 pH. (Note: the acetic acid is coming from *lactobacilli*, not acetic acid bacteria, as one might have supposed.) The prevention, of course, is the addition of judicious amounts of SO₂ at the crusher, followed by inoculation with yeast starter.

Another "new" spoilage also seems to be related to maintenance amounts of SO₂ and also to redox potentials. Some strains of *Acetobacter pasteurianus* are apparently less resistant to SO₂ and also require less oxygen than the standard vinegar strains of *A. aceti*. With renewed emphasis on management of SO₂ concentrations in stored wine and more rigorous efforts to maintain lower redox potentials in them by persistent sparging with nitrogen gas, this problem seems to have disappeared.

Happily, some "new" solutions for old problems have also come to the fore. The earlier infatuations with *Brettanomyces* infections in some quarters have now mostly been supplanted by a scornful acceptance coupled, in almost all quarters, with a keen desire to establish

firm control over its growth.

Current analytical techniques are sensitive enough to measure specific end products of *Brettanomyces* spoilage, such as ethyl phenyl.¹ This promises to serve as "an early warning system" in substitution for the standard microbial procedures, which require more time and are not as sensitive.

What will the next 100 years bring? Of course old and new problems of microbiological spoilages will continue to be with us. But wine microbiologists are just now entering into a very exciting time, comparable to that following Robert Koch's development of procedures for pure cultures.

This new period begins with fresh technology, the availability of karyogamic typing — that is, genetic identification — of yeast and bacterial strains. Up until now, these identifications, even for such well-known and famous strains as Montrachet, Prise de Mousse, MCW, or ML34, could only be made with the use of biochemical, physiological, and morphology methods — always imprecise at

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WINEMAKING

this taxonomic level.

Equally as practical, is the associated technology — the use of "genetic engineering" to provide new yeasts and bacteria for all sorts of metabolic activities during and after vinification. For example, with the current technology, it is indeed feasible ("easy" with enough funding!) to "manufacture" a wine yeast strain, which is different from the other strains only in the structure of one of its enzymes in the pathway of glycerol production. It could have a changed affinity for a coenzyme and would be a yeast strain to answer winemakers' fantasies, a yeast strain that would produce from grape juice a wine with a few percent more of glycerol and a few percent less of ethanol!

Of course legislative, judicial, and public concerns, and indeed good science, demand that these "new compositions of matter" not be put into commercial use.

However, with the strain typing procedures mentioned above, which can find a needle in a haystack, such laboratory strains could (and will) be used to

"tweeze out" any natural yeast genotypes with the above characteristics (which certainly exist) from native, ecological, and indigenous populations of microbes. With appropriate screening and testing, these "natural" strains can then be employed in production.

I initially gave this report the whimsical subtitle: "Have we changed or have the microbes?" Perhaps it is not so whimsical after all.

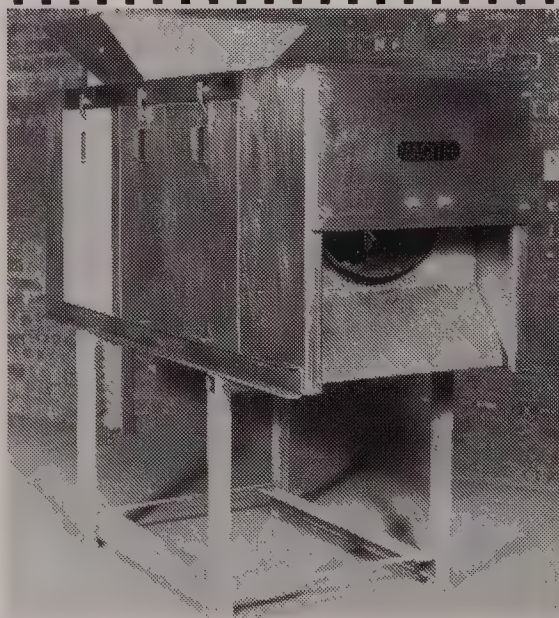
Edited from a presentation at the Wine Spoilage Microbiology Conference, March 8, 1996, California State University, Fresno.

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Wine & Health Symposium

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Can wine improve your health? This is one of the hottest questions to the health-conscious public today. The American Society for Enology & Viticulture is sponsoring a national symposium to answer this question — from heart disease to headaches. The second day will include discussion of whether or not wine should be a recommended part of our diet.

This symposium is for wine producers and marketing specialists who want to understand the science behind the health claims for wine. It is also for those in the medical profession who want to know the basis of the changing recommendations related to alcohol consumption. Speakers will explain what is well-established and what is currently under debate. For those undecided topics, you will learn the arguments on each side, and perhaps, what it will take to resolve those issues.

Topics on Day One:

- Can any use of wine overcome the drawback of abuse? David Pittman.
- How could wine reduce heart attacks? Rosemary Walzem (University of California, Davis) will clarify the oxidation situation, and John Folts (University of Wisconsin) will explain platelet aggregation.
- Does wine affect cancer? Susan Ebeler (University of California, Davis) will explain the known relationship between wine consumption and cancer disease rates, and the basis for observed effects.
- Headaches — some consumers complain that red wine gives them headaches. Is there a basis for this claim? Mark Daeschel (Oregon State Univ.) will discuss organic amines in wine as a possible culprit.
- Is wine consumption a cause of Fetal Alcohol Syndrome? David Whitten (Kaiser Permanente) will show whether or not there is a relationship.
- Can sulfites or other additives cause allergic reactions to wine? Vincent Marinkovitch will show the effects of some fining agents, and Alan Bakalinsky (Oregon State Univ.) will discuss sulfites.
- How safe is wine? Ken Fugelsang (California State University, Fresno) will explain.
- Winemakers want to know if ethyl carbamate is considered a health threat. Linda Bisson (University of California, Davis) will discuss up-to-date toxicology and policy issues.
- Is wine the only alcoholic beverage that is associated with lower mortality? Elisabeth Holmgren (Research Director from Wine Institute) will summarize the significance of the famous Copenhagen study and other health-related studies published recently.
- Should wine be *recommended* as part of the American diet? Do recent reports of reduced disease among wine drinkers warrant a recommendation to all Americans to drink wine to improve their health?

The above will be discussed and debated on the second day of the Symposium by a panel including: Dwight Heath (Brown University); Curtis Ellison, M.D. (Boston University); Michael Criqui, Ph.D. (University of California, San Diego); George Hacker (Center for Science in the Public Interest); Archie Brodsky (Harvard University Medical School);

William Earl (Bureau of Alcohol, Tobacco & Firearms); Kathleen Ellwood (U.S. Dept. of Agriculture); Richard Harding (U.K. Ministry of Agriculture, Fisheries & Food).

Call 916/753-3142 for registration information.

July 11-14, 1996

1996 Women for WineSense National Convention

Portland Marriott Hotel, Portland, OR

"Wine: A Positive Perception" will be presented by keynote speaker Jancis Robinson. The convention will center on topics surrounding wine and health, bringing wine education to community groups, and expanding consumer palates and awareness. Speakers include: John Gillespie (Wine Market Council), Dr. Lydia H. Powell (Rush-Presbyterian Medical Center, Williamette, IL), and Dr. David Whitten (physician, author, educator).

Men, women, wine novices, and connoisseurs are all welcome to attend.

For more information, contact: Nancy Daniel, tel: 503/581-7458, or fax Maria Ponzi at 503/628-0354.

July 16-20, 1996

Fourth International Symposium on Cool Climate Viticulture & Enology

Rochester Riverside Convention Center, Rochester, NY

PROGRAM:

Adaptation to regional environments — Oral presentations: "Trellis systems, adaptations, and implementations, worldwide," R. Smart; "Considering cultivar selection as a main element in sustainable viticulture," P. Basler, Switzerland; "Rootstock and vine spacing effects on growth, root distribution and water utilization by Cabernet Sauvignon grapevines in Napa Valley," R. Kliever, USA; "Effects of row orientation on growth, yield, quality, and dry matter partitioning in Chardonnay vines trained to simple curtain and spur-pruned cordon," C. Intrieri, Italy; "Environmental effect on crop load, vigor, and grape composition of Sauvignon blanc in the cool climate of alpine viticulture," Bertamini et. al, Italy; "New Zealand terrior: Sources of variation in fruit composition in New Zealand vineyards," Trought, New Zealand; "New maps of vine growing areas in Hessen, Germany," Jagoutz et. al., Germany. Plus nine poster presentations.

Vine stress physiology — Oral presentations: "Stress response to altered source/risk relationships in grapevines and their stress-recovering capacity," W. Koblet, Switzerland; "Practical considerations that impact vine cold hardiness," R. Wample, Wash. State Univ. and T. Wolf, Virginia Poly. Tech Inst. & State Univ.; "Biophysical and biochemical aspects of cold hardiness in woody plants, including grape," M. Wisniewski, USDA/ARS W.Virginia; "Sap flow measurements on grapevines," Schmid & Ruhl, Germany; "Carbohydrate supply limits fruit set in commercial Sauvignon blanc grapevines," Caspari & Lang, New Zealand; "Whole-vine carbon gain and water use during water deficits. Scaling up from the leaf to the canopy," Schultz & Lebon, Germany; "Response of Chardonnay grapevines to wind-

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breaks in the Salinas Valley," L. Bettiga et al., USA. Plus 15 poster presentations.

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irrigated vineyards," Pool et al., USA; "An assessment of growing season thermal and moisture environment for timing pest and disease control in Niagara vineyards," Shaw, Canada; "New experience of nitrogen dynamics on permeable soils, environmental aspects and wine quality," Wahl et al., Germany; "Use of a computer-based network and powdery mildew risk assessment model reduces fungicide use in the Napa Valley," E. Weber, et al., USA; "A new strategy for inert blanketing of wine," Allen & Ewart, Australia.

Wine sensory attributes; Techniques of measurement — Oral presentations: "Wine scoring," H. Lawless, USA; "Descriptive analysis," M. McDaniel, USA; "Gas Chromatography-Olfactometry," T. Acree, Cornell Univ., USA; "Instrumental & Sensory Correlations," P. Schlich, INRA, France. Plus 13 oral/poster presentations.

Flavor development in the vineyard — Oral presentations: "Viticulture and site N: their impact on monoterpene flavo- rants and wine sensory perception," A. Reynolds, Canada; "Fruit environment and prefermentation practices for manipulation of monoterpene, norisoprenoid, and pyrazine flavo- rants," J. Marais, South Africa; "Regional typicity of California Chardonnay wines: Towards using the terrior model and strengthening American viticultural areas," Arrhenius et al., USA; "Influence of genotype-training system and bud load on berry flavor content of cv Sauvignon Blanc," Colugnati et al., Italy; "Vineyard effects on phenolic com- pounds in Pinot noir grapes and wine," Price et al., USA;

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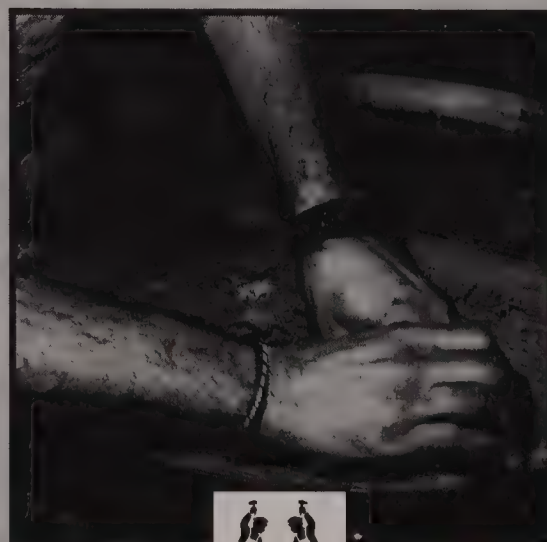
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"Microclimatic influences in the vineyard on the flavor quality of grapes," Razungle et al., France; "Effects of different pruning lengths, fruit-thinning, and soil management on the vegetative and generative production and wine quality," Wahl & Heigel, Germany; "Effect of fruit zone leaf removal on Chardonnay and Cabernet Sauvignon grape glycosides," Zoecklein et al., USA; "Effect of crop level on Cabernet sauvignon and Chardonnay grape glycosides," Zoecklein et al., USA.

Flavor development during fermentation — Oral presentations: "Vinification techniques to shape the wine flavor profile," G. Baldwin, Australia; "Flavor precursors in grape juice and changes during fermentation," P. Williams, Australia; "Effect of pre-fermentation cold maceration on the composition, color, and flavor of Pinot noir wine," D. Heatherbell, New Zealand; "Fermentation practices in Pinot Noir: Effects on color, phenols, and sensory character," B. Watson, USA; "Role of yeasts in the formation of wine flavors," A. Dumont, Canada; "Wine flavor modifications by lactic acid bacteria," S. Krieger, Germany; "Contribution of selected apiculate yeasts isolated from grape and must to the aroma of cool climate wine 'Recioto and Amarore' of Valpolicella area," G. Comi et al., Italy; "Effects of fermentation temperature on aroma impact compounds of Swiss Chasselas wines," F. Hesford et al., Switzerland; "Ageing of wines, TDN and aminoacetophenone," W.R. Sponholz, Germany. Plus 12 poster presentations.

Understanding the genetic basis for grape and wine production — Oral presentations: "Overview of microbial genetics in relation to wine production," F. Zimmermann, Germany; "Ecology of yeasts and bacteria in winemaking; molecular biological studies with practical conclusions," J. Gafner et al., Switzerland; "Overview of grapevine genetics — in relation to vine improvement, gene mapping, genetic transformation and fingerprinting," C. Meredith, USA; "Scion and rootstock varieties for cool climates," A. Reynolds, Canada. Plus seven poster presentations.

Economics and marketing — Oral presentations: "Marketing cool climate wines," Dr. Peter Botos, Hungary; "Product differentiation: brands, appellations, and varietal labeling," Dr. Kirby Moulton, USA.

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Yeast and bacterial starter cultures — Oral presentations: "Establishing cultures for production of premium quality vinegar," C. Cone, USA; "Care and feeding of *Leuconostoc oenos* - making malolactic fermentations happen," E. Harkness, USA; "Establishing healthy spontaneous fermentations," T. Henick-Kling, USA; "Realizing full potential of commercial yeast starter cultures," P. Monk, Australia; "Working with *Brettanomyces* and other 'in-house' strains," C. Shelton, USA.

From farm to fork: Information management in the emerging network environment — P. McDonald, USA.

Winery Sanitation — D. Carisetti, USA.

Assessing need for irrigation in cool climate vineyards — A. Lakso, USA.

Vineyard mechanization — Dr. R. Pool, USA.

Integrated pest management — Dr. T. Weigle, USA.

Flavor development in the vineyard — an industry perspective — A. Reynolds, Canada; Z. Long, USA; D. Roberts, USA; R. Smart, Australia.

Wine marketing: VQA and NYS — P. Gamble, Canada; and J. Tresize, USA.

WORKSHOPS:

Sparkling wines: A cool climate's best ambassadors — P. Bell, USA.

Wine aroma defects — G. Baldwin, Australia; T. Acree, USA.

Assessing sensory quality — H. Lawless, USA.

Wine sensory analysis: a contribution towards an objective assessment of wine quality — U. Fischer, Germany; J. Buechsenstein, USA.

Specialty beer workshop — R. Riesen, USA.

Pinot Noir wine quality: Managing color and phenols — B. Watson, USA; S. Price, USA; V. Gerbaux, France.

Wine and food events: Tuesday wine and dinner welcome. Wednesday theme lunch: Ontario, Canada. Wednesday evening non-U.S. wine grazing reception. Thursday theme lunch: Ohio. Thursday evening wine and food reception: northeast and midwest U.S. Friday lunch: "Wine, Health, & Lifestyle." Friday evening wine and food reception: northeast U.S. and British Columbia. Saturday sparkling wine reception and banquet.

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Physiology of Grape Leaf Ageing

as related to **IMPROVED CANOPY MANAGEMENT** and **GRAPE QUALITY**

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ABSTRACT

The following surveys the current knowledge on the ageing of single grapevine leaves and, based on research at the University of Bologna, suggests how this basic information can be used to establish reliable guidelines for summer pruning techniques.

Shoot trimming, which typically causes a sudden initial increase in average canopy age and then a rejuvenation due to lateral regrowth, should be calibrated to promote laterals that become mature around veraison.

The preference for fruit-set shoot trimming to retain 12 to 15 leaves per main shoot has proved the most suitable in vigorous Italian vineyards to achieve both vine size control and quality maintenance. If the expected lateral regrowth is weak or absent due either to adverse environmental conditions (e.g. water stress) or inherent vigor limitation caused by shoot growth habit (e.g. downward canopies like Geneva Double Curtain), the extent of leaf area retained for fruit ripening may still be sufficient although overall leaf function may be lower. This is due to the lack of beneficial effects related to foliage rejuvenation.

Given the complex canopy modifications induced by summer pruning (total light interception, relative leaf and bunch exposure, leaf-to-fruit ratio, age), greater attention is being directed to new methods that can better account for the interactions of all the factors involved.

Introduction

Ageing is an integral part of leaf development and, like any developmental process, subject to direct genetic control. As leaves grow and chloroplasts are assembled, carbon fixation rapidly peaks at, or just before, full leaf expansion. Thereafter, photosynthesis steadily declines.

The present study surveys the main physiological factors of leaf ageing in grapevines as indicated by recent research at the University of Bologna. How such data can be used for a more focused application of canopy management techniques is highlighted. The emphasis is primarily on operations such as summer pruning, which when applied either as shoot trimming or basal leaf removal, invariably induce significant changes in canopy characteristics, which in turn has various effects on grape quality.

Factors that control leaf ageing

Of the several indicators that can be employed to track the course of leaf ageing (loss of chlorophyll, proteolysis, respiration rate, changes in the fine cell structure), the photosynthetic rate has by far been the most widely used in grapes as well as in other fruit crops. Its value has been greatly enhanced over the last decade with the advent of commercially available, portable single-leaf gas analysis systems. Such systems have become very popular because they are easy to use and can run several measurements in a relatively short period of time.¹⁰

A note of caution is generally needed when evaluating leaf ageing effects. A typical experimental approach is to tag a single leaf when still expanding and monitor its photosynthetic rate over time. The resulting plot obtained is referred to as "ageing," implying a genetically determined loss of function.



Mechanical shoot trimming performed on a vertical canopy with upright shoots (spur-pruned cordon) by a multiple cutter-bar machine at fruit set. The minimum height of shoot topping is determined by the distance of the top pair of foliage wires from the cordon.

Yet the trend observed might also be a reflection of changes in the plant's growth status or in the leaf-to-fruit ratio (the source/sink balance).

Pioneer^{8,9} and more recent² studies carried out on potted vines have indicated a consistent relationship between leaf age and net photosynthesis (Pn). Pn rapidly increases during leaf growth, peaking at about 35 to 40 days of age, and then gradually declines. In the longest leaf-age span examined (about 140 days), four-month-old leaves were found to retain 70% of maximum Pn.²

Although conducted on potted vines, these studies stress that a fundamental characteristic of leaf ageing in grapes is a rather early decline of Pn as compared to the leaf-age span. This finding is also supported by regression analysis of Pn versus leaf position.²

When calculated for Sangiovese potted vines during active shoot growth, this regression indicates very low photosynthetic rates for rapidly expanding apical leaves (10 to 15 days of age), peak rates for leaves around node 13 of the stem (40 days of age), and then a rapid decrease.

Given the inherent constraints of systems like potted vines (lack of strong sink primarily due to the absence of or poor crop, mutual shading caused by vertical shoot positioning), a field approach for investigating the effects of ageing of grape leaf physiology is necessary.

Poni et al. (1994), working on three-year-old, field-grown Sangiovese grapevines, tied the shoots to a horizontal frame for maximum light exposure prior to and after development of each leaf. This approach was designed to minimize the interference of the light microclimate on leaf ageing.

To assess the interaction between leaf age and other factors, shoots were either defruited prior to flowering or not (control) and either treated at veraison with kinetin — an exogenous cytokinin known for its ability to retard foliar senescence in various crops — or not (control).¹⁹

Thirteen times from budbreak to harvest, leaf function was determined by a portable gas-exchange system, starting with the first normally-formed basal leaves on each shoot and then proceeding towards the apex with every third

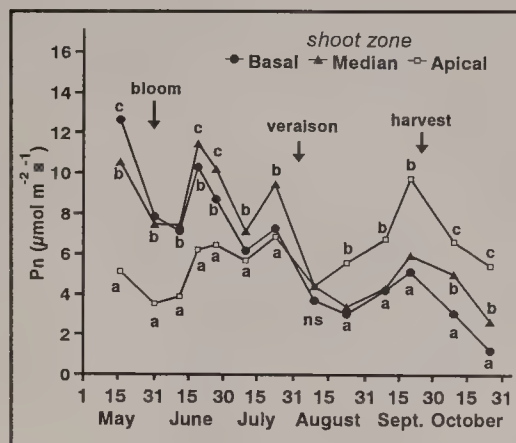


Fig. 1. Seasonal pattern of leaf net photosynthesis (Pn) as affected by leaf age in relation to basal, median and apical shoot zones. Mean separation within each date by Student-Newman-Keuls test, $p < 0.05$.

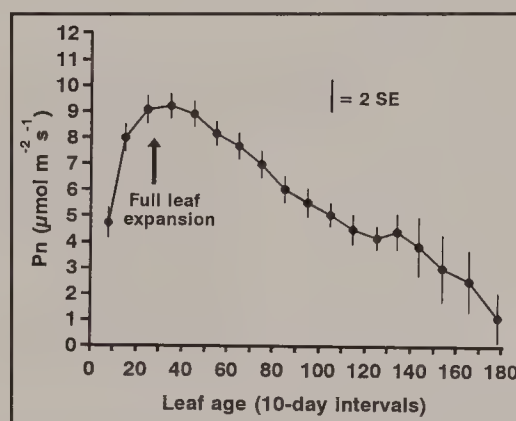


Fig. 2. Relationship between leaf age, given as days after unfolding, and Pn calculated on a seasonal basis. Each point is the mean of Pn values falling into 10-day categories. Vertical bars represent 2 SE.

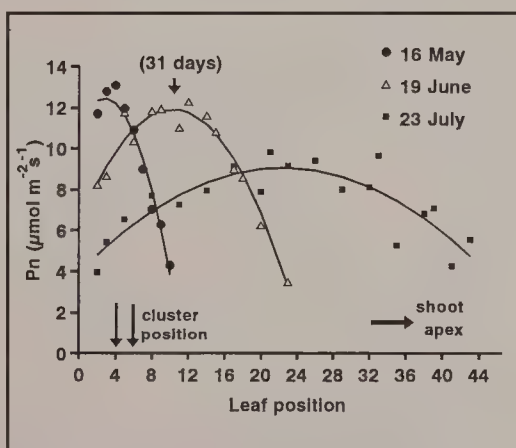


Fig. 3. Curvilinear regressions between Pn and leaf position calculated for three dates before veraison. Regression equations are: $y = 11.2 + 0.930x - 0.166x^2$, $R^2 = 0.95$ (16 May); $y = 6.4 + 1.093x - 0.0537x^2$, $R^2 = 0.94$ (19 June); $y = 3.9 + 0.458x - 0.0102x^2$, $R^2 = 0.70$ (23 July). In brackets is the age of leaves at maximum Pn on June 19 vs. position.

leaf. Analysis of the data recorded on each sampling date demonstrated a strong age-related effect and the lack of significant interactions between crop level and kinetin treatment.

When the mean Pn rates were calculated per shoot zone and plotted against time (fig.1), the apical leaves still undergoing a rapid expansion (leaf age ranging from 8 to 18 days) showed lower rates than basal and median leaves up to veraison. When they reached full maturity at veraison, the same apical leaves become the most efficient, retaining this capacity until leaf drop.

We can infer the dynamics of shoot efficiency throughout the season from data in fig. 1. This data also indicates that, despite the effects on assimilation due to typical day-to-day variations, the differences attributable to leaf age are very pronounced.

When pooled to calculate the average leaf-age span (about 180 days), the same data yield a general relationship between Pn and leaf age (fig.2), confirming a Pn peak at 35 to 40 days followed by a slow but steady decline. The rate of Pn decline in this case appeared slightly faster than that reported for the same cultivar planted in pots.²

The data in fig. 2 were also analyzed as regression of Pn versus leaf position along the stem. The correlations between these parameters were calculated at three dates before veraison and invariably showed a non-linear (quadratic) relationship (fig.3). Note that in

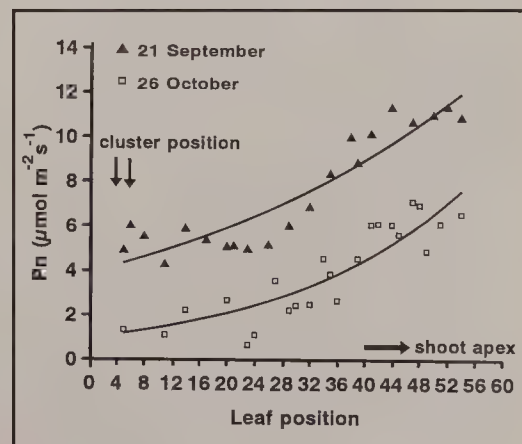


Fig. 4. Non-linear regressions between Pn and leaf position calculated for two dates after veraison. Regression equations are: $y = 3.91 * \text{EXP}(0.021x)$, $R^2 = 0.86$ (21 September); $y = 0.98 * \text{EXP}(0.038x)$, $R^2 = 0.79$ (26 October).

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June, besides the marked Pn reduction measured on the rapidly expanding apical leaves, the basal leaves at nodes two through four (48 to 52 days old) exhibited a lower Pn rate than the peak recorded for median leaves at nodes 10 through 12 (average age 31 days). This finding further supports the precocious Pn decline in grapevine leaves since measurements during each date were taken within two hours.

Regressions of Pn versus leaf position plotted for two dates after veraison yielded a totally different pattern than for pre-veraison (fig.4). Due to the marked decrease in the photosynthetic rate of basal and median leaves, the relationships turned out to be exponential, with Pn rapidly increasing towards the apex. Clearly, at this final stage of canopy growth, the mature apical leaves are the youngest in the canopy and are the most photosynthetically active.

The comparative seasonal and diurnal analysis of the leaf age/Pn relationships associated with the lack of significant interactions with other factors (e.g. crop level and cytokinin application) support the assumption that leaf ageing is strongly genetically controlled and difficult to manipulate.

While the shoots tested by Poni et al. (1994) were kept horizontal to minimize the effect of light exposure on the leaf senescence, the leaves in an unaltered, fully grown canopy are positioned differently and experience a different light microclimate during and after leaf expansion.

Silvestroni et al. (1993) set up a preliminary study to investigate the effects of whole-vine light conditioning on the foliar senescence of potted Sangiovese vines. Three-year-old plants were trained to single vertical shoots and left to develop as "sun" leaves in outdoor cabinets under 90% full light.

Once the vines had formed an average of 22 to 24 leaves (corresponding roughly to fruit-set in bearing vines), the shoots were trimmed to retain only the fully expanded leaves. Then, vines were randomly assigned to two 10-unit groups and kept either under 90% full light or under severe shading by enclosing them in outdoor cabinets draped with green net to reduce the incoming photosynthetic flux density (PFD) to 8% (measured at foliage level) and the red (R)-to-far-red (FR) ratio down to 0.40.

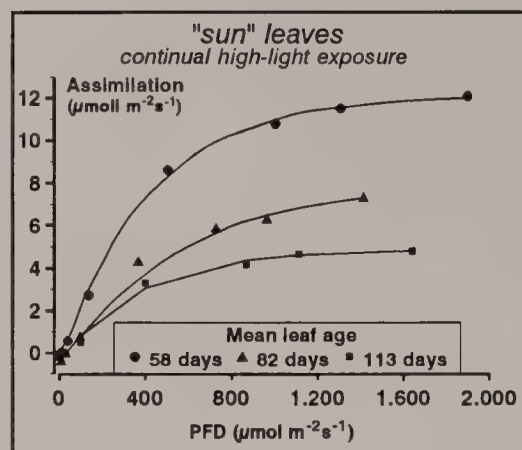
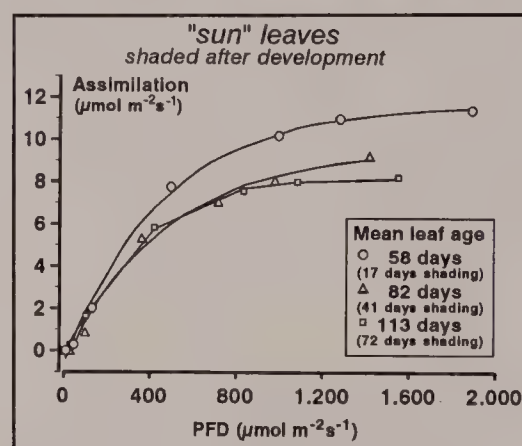


Fig. 5. Light response curves determined on "sun" leaves continuously exposed to high light (A- above) or shaded after development (B- below) at increasing age levels.



The resulting interaction between leaf age and light exposure ("sun" leaves continuously exposed to high light and "sun" leaves shaded upon completion of growth) was studied by drawing light-response curves for leaves of increasing age (Figs.5a,b). The full-light "sun" leaves showed a far lower rate (about 60%) of light-saturated Pn rate in 113-day-old leaves than the maximum rates recorded for 58-day-old leaves (fig.5a). By contrast, a much slower decrease in the light-saturated Pn rate versus leaf age occurred in shaded "sun" leaves: 113-day-old leaves retained 70% of maximum Pn as determined under full light for the youngest leaf age group (fig. 5b).

The results in figures 5a and 5b support the assumption that continuous exposure of grapevine leaves to high light can likely result in concurrent high temperature stress, which may induce accelerated leaf ageing. Several observations support this hypothesis. The slightly faster leaf ageing on horizontal rather than vertical shoot system documented in the field by Poni et al. (1994) reflects the fact that most of these

leaves experienced prolonged exposure to high light. Also, visual observations of the overhead trellis indicate that the top leaf layer undergoes a very rapid senescence and is soon replaced by new leaves underneath it.

While findings derived from whole-vine light treatments should be very cautiously extrapolated to the field, where leaves in a single canopy are subject to markedly varying light regimes, the data in fig. 5b suggest that temporarily shaded "sun" grapevine leaves can react well to re-exposure to light (e.g. as occurs after summer pruning).

The interaction of leaf position and light exposure in a field-grown grapevine canopy is currently being studied using a modification of the classic point-quadrat method for canopy analysis, in which metal rods, simulating sunbeams, are pushed into a canopy.¹⁴ A new laser device to simulate the sun's movement over vines is employed to determine which organs intercept light (fig.6). Leaves, clusters, or any other organs directly hit by the laser's beam are classified as well-exposed.

This technique has enabled a preliminary evaluation of the relative exposure of main and lateral leaves in a fully grown Geneva Double Curtain (GDC) canopy as a function of their position (and therefore age) along the stem (fig.7).

The maximum frequency of contacts with main leaves occurred at nodes six and seven, a likely result of downward shoot positioning and leaf size. Conversely, most of the light intercepted by the laterals was registered at nodes one and two, where the leaves are far larger than those above them. Grapevine training systems of varying canopy geometries are also being studied to determine which leaves intercept the most light at crucial stages of seasonal growth.

Interactions of leaf ageing and cultural practices

Leaf age and shoot trimming

Given the good or even excessive vine vigor of Italian vineyards, shoot trimming is by far the most widely applied summer management technique. It poses two main issues for growers: mechanization and impact on yield and grape quality.

Fig. 6. Laser scanning of a mature grapevine canopy. The device has a semi-circular steel arc representing the sun's track, a supporting structure that can angle the arc to the latitude of the specific site (α) and align the device NS, and a laser beam attached to the arc by a swivel ball which allows adjustments for solar declination at the given time of the year (β). Once the latitude inclination is set, the movement of the laser along the arc matches that of single sunbeams.

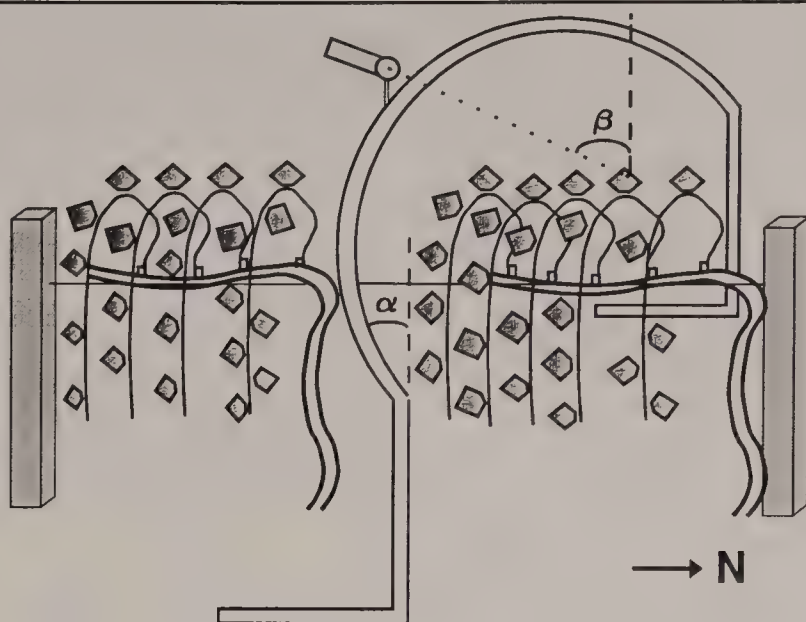
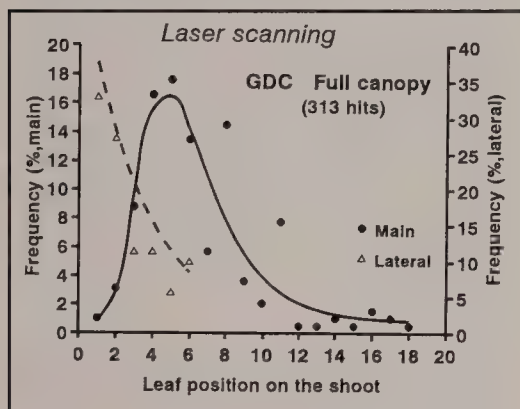


Fig. 7. Frequency distributions of laser contacts with main and lateral leaves recorded at full canopy in NS-oriented, GDC rows.

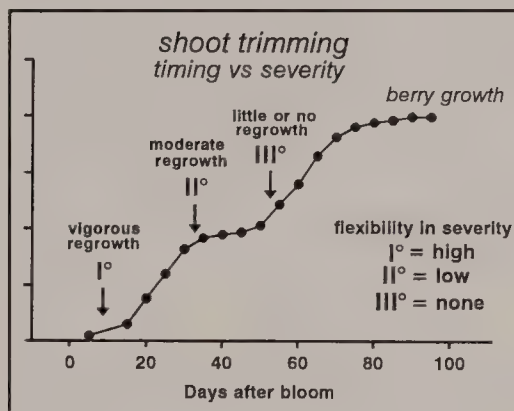


Most of the technical problems related to mechanical shoot trimming of training systems of differing trellis structure and canopy shape have been overcome. Shoot trimming, however, invariably induces marked variations in vine physiology and must therefore be considered a rather delicate technique.

Whenever shoots are trimmed, important changes in total light interception, relative light exposure of leaves and clusters, leaf-to-fruit ratio, and canopy age occur.

The link between shoot trimming and canopy age is particularly straightforward. When the shoot's apical part is removed by trimming, the canopy experiences a sudden increase in age prior to rejuvenation, which depends upon the rate and extent of lateral regrowth. The combined effects of these phenomena can be either favorable or unfavorable to berry ripening depending on two key factors: timing

Fig. 8. Predicted vine response to various combinations of timing and severity of shoot trimming. The model refers to the high vigor conditions of the Po River valley (Italy).



and severity of trimming. The physiological background of the leaf-age pattern in grapevines thus becomes essential to the development of useful management guidelines.

Shoot trimming applied at fruit set (fig. 8, I°) usually induces a strong regrowth of laterals, which due to early formation and fairly high growth rates, are likely to become fully mature and act as source for most of stage three of berry growth.

The removal of main shoot tips and young leaves at fruit set should have a positive effect on the rate of concurrent berry cell division (by temporarily eliminating or diminishing competition), whereas most of the competition due to lateral growth should take place during the lag-phase when berry development is inherently reduced or inhibited.

Given the potential of achieving a

consistent vegetative regrowth, the flexibility in the severity of early trimming is high, thus allowing a certain variability in the minimum number of leaves retained per main shoot.

Trimming in the lag-phase of berry growth (fig. 8, II°) occurs in a period when shoot growth has usually markedly slowed down and may cause a rather variable pattern of regrowth.

In non-irrigated areas, if rainfall is not a limiting factor after trimming, laterals may still reach maturity. But a period of water stress would result in little or no lateral promotion. In the case of water stress, laterals would primarily compete with grapes for nourishment without being able to grow to full size due to the short growing period and/or slow growth rates.

In addition, the development of new leaves during a period of water shortage can be quite detrimental for whole-vine water use efficiency since these leaves, although strongly limited in their photosynthetic capacity, can transpire as much water per unit of leaf area as older, fully expanded leaves.¹²

Given the considerable risk of not achieving adequate canopy refill, mid-season shoot trimming offers little flexibility in severity and the retention of a basic minimum number of leaves on the main shoots is advisable.

Shoot trimming around veraison induces in most seasons little or no lateral regrowth. Although some capacity for photosynthetic compensation has been highlighted in main leaves,¹ this late trimming can very likely induce a

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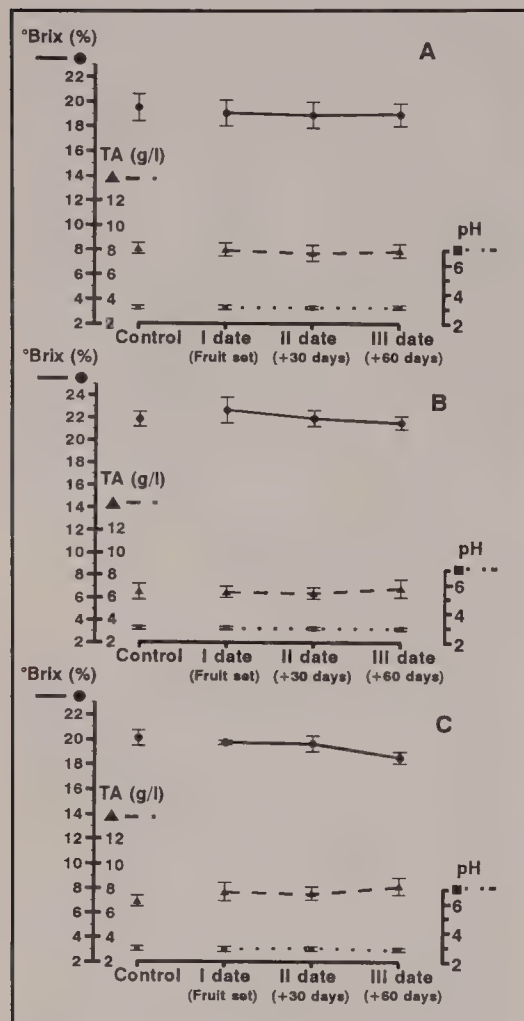


Fig. 9. Variations in must parameters (Brix, pH, TA) recorded on simple curtain-trained vines of Sangiovese (A), Pignoletto (B), and Trebbiano R. (C) trimmed at different timings during the season and compared to control vines. Trimming severity was set to retain approximately 12 mature leaves on main shoots. Each data point represents 5-year-means.

permanent reduction in vine leaf area. Care should therefore be taken to determine whether the amount of remaining foliage is sufficient for crop ripening.

The literature offers variable results as to the interactions of timing versus severity of shoot trimming for different cultivars and environments. In general, there is good reason to consider severe (e.g. five to six main leaves retained per shoot) and mid-to-late trimming detrimental to yield and fruit composition responses.^{11,15} This would confirm that poor lateral regrowth associated with retaining basal, rapidly senescing leaves on the vine has cumulative, negative effects on vine performance.

More controversial are the reports dealing with the effectiveness of early shoot trimming and its severity. While in some cases early, severe shoot trim-

Table I. Comparison of vegetative growth of GDC- and SPC-trained vines trimmed at post-bloom to 12-14 main leaves.

Data are given on a per meter of cordon basis (92-94 means).

	Shoots**	Total leaf area (m ²)	Main (m ²)	Laterals (m ²)	Removed with trimming (m ²)	Pruning weight (g)
GDC	17.5	3.4	3.1	0.3	0.5	640
SPC	17.7	4.9	3.6	1.3	0.9	1220
sig.	ns	*	*	*	*	*

Table II. Comparison of yield, grape quality, and crop load of GDC- and SPC-trained vines trimmed at post-bloom to 12-14 main leaves.

Data are given on a per meter of cordon basis (92-94 means).

	Yield (kg)	Brix %	Sugar (kg/m)	TA (g/l)	Leaf-to-fruit ratio (cm ² /g)	Yield-to-pruning weight ratio
GDC	5.8	19.8	1.116	8.5	7	12.6
SPC	7.7	19	1.492	9.6	7.9	7.7
sig.	*	ns	*	*	ns	*

ming has induced yield and quality responses similar to less severely pruned or untrimmed vines,¹⁵ in others it has caused undesirable must characteristics.¹¹ Which response will occur seems again to depend primarily on how much lateral leaf area there is. If this development is high enough, it can minimize or totally offset defoliation stress.

A long-term study on the simple curtain-trained cultivars — Sangiovese, Pignoletto, and Trebbiano R.³ — showed that, regardless of timing, must quality was not affected with respect to unpruned vines when light trimming severity (about 15 main leaves retained per shoot) was adopted (figs. 9a,b,c). These results indicate that light, early shoot trimming can achieve vine-size control, the main goal, without significantly altering grape composition in comparison to untrimmed vines.

Currently, this approach to shoot trimming is certainly the most advisable. Indeed, even when an unexpected poor lateral regrowth occurs, the amount of leaf area retained minimizes the risk of severe deficiency in the photosynthetic ability.

If lateral development is a key-factor in regulating vine response to shoot trimming, it should also be noted that lateral development can vary greatly, not just as a function of inherent varietal vigor and climatic conditions, but also depending upon trellis type and

the related shoot-growth habit.

It is well-established that, even in the absence of trimming,⁶ growth rates and final development of main and lateral shoots are higher in upward growing systems (e.g. spur-pruned horizontal cordon) than in downward growing canopies (e.g. GDC or simple curtain). Thus, it can be expected that vines grown on the same site would have a different reaction to trimming, depending on whether the shoots were trained upward or downward.

This assumption was tested in a three-year study on GDC and spur-pruned cordon (SPC) vines (Intrieri et al., unpublished). Vine reaction to shoot trimming at fruit set was assessed under uniform total cordon length per vine (two meters) and shoot number (about 17 shoots/m). The severity of trimming was about 15 leaves per main shoot, in accordance with current grower guidelines.

The effects on vegetative growth (Table I) confirm higher vigor in the SPC vines as indicated by final total leaf area and pruning weight values. Interestingly, lateral shoots, most of which developed after trimming, accounted for 27% of total leaf area, as opposed to only 10% of total leaf area in GDC-trained vines.

A comparison of yield and quality performance of the two systems (Table II) indicates that, despite a two-kg increase in yield, the decrease of Brix in SPC was

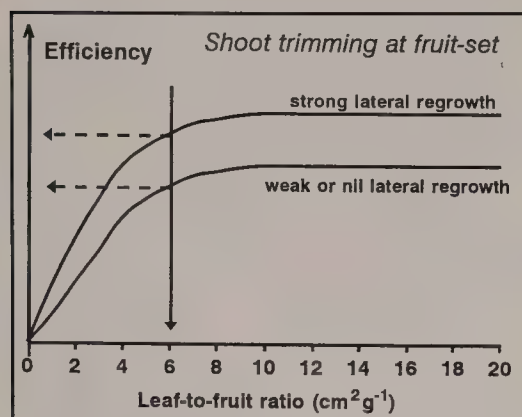


Fig. 10. Modification of the relationship between leaf-to-fruit ratio and vine efficiency as a function of either strong or weak lateral regrowth subsequent to shoot trimming at fruit set. With other factors being equal, the different leaf function at the same leaf-to-fruit ratio reflects beneficial effects of canopy rejuvenation associated with considerable lateral formation.

moderate, whereas total vine potential, expressed as total sugars per unit of cordon length, revealed a significantly higher efficiency in the upright canopy.

Moreover, GDC and SPC vines showed similar final total leaf area-to-yield ratios, thus indicating a very comparable source-sink balance (Table II). This finding suggests that these trellises had a differing leaf function at the same leaf-to-fruit ratio (fig. 10).

It may be assumed that in SPC, the foliage efficiency was higher on a seasonal basis due to formation of a good number of laterals, which contributed to a canopy rejuvenation and lowered the average age of the source. Despite the availability of a similar leaf area per unit of crop, the GDC canopy could not benefit from this rejuvenating effect and ripening had to rely primarily on the contribution of the main leaves.

Leaf age and basal leaf removal

Like shoot trimming, mechanical basal leaf removal can be easily, and successfully, performed in properly trained vineyards.⁴ The main requirements are a well-confined fruiting area, primarily achievable by spur-pruning, and manifest conditions of excessive leaf density at the cluster level.

It is generally thought that removal of basal leaves around veraison should not be too detrimental to whole-vine efficiency since the oldest leaves are removed and the younger ones retained. This analysis, however, is

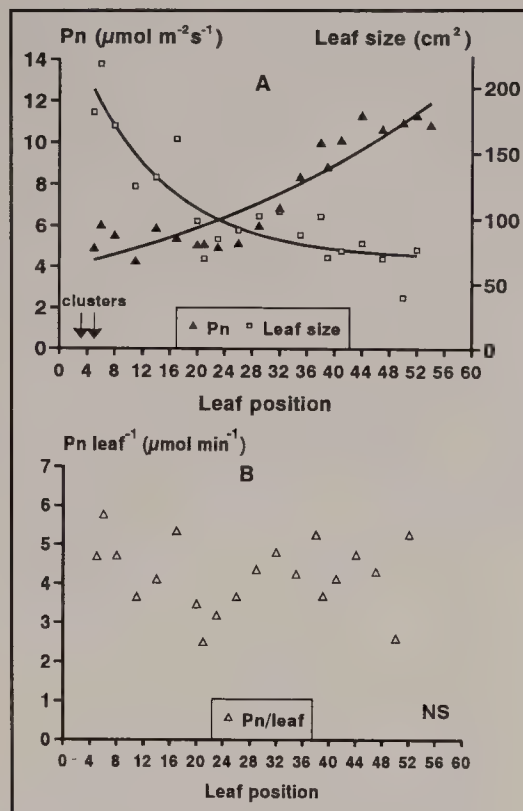


Fig. 11. Variation of Pn expressed either as per unit of leaf area (A) and per leaf basis (B) as a function of position along the shoot and calculated on 21 September. Lack of correlation in B reflects variation of leaf size along the shoot (A).

entirely based on the leaf senescence pattern, typically evaluated on a per unit of leaf area basis.

To quantify the real overall contribution of basal leaves to the photosynthetic supply, assimilation rates should also be expressed on a per leaf basis, including the effect dependent on leaf size. Regression of Pn/leaf versus leaf position plotted for a post-veraison date of field-grown Sangiovese vines proved non-significant, since the large size of the basal leaves offset their lower photosynthetic rate (figs. 11a,b). This compensation effect should be checked for specific cultivars and environmental conditions as the pattern of leaf size in relation to position along the stem can obviously change.

A condition similar to that reported in fig. 11b, however, implies that, at specific dates, each shoot zone contributes equally to photosynthesis. Such a situation can certainly facilitate the estimate of optimal severity for basal leaf removal, which should be fundamentally guided by quantitative concerns, that is, the maintenance of enough leaf area for crop ripening.

Future research on summer pruning

In the past, a marked emphasis has been placed on the multiple effects of summer pruning (analyzed either as shoot trimming or basal leaf removal), on canopy structure, microclimate, and function. Although basic information already available on the response of single leaf to factors typically altered by summer pruning (e.g. light and age) can help in predicting the overall effects of such techniques, there is urgent need for direct assessment at the whole-canopy level.

An automated whole-vine gas exchange system has been designed and set up for this purpose.¹³ Field trials to monitor the effects of summer pruning techniques on whole-canopy gas exchange are in progress.

Conclusions

Shoot trimming as a tool in vine-growth control is frequently necessary in vigorous Italian vineyards. Under these circumstances, a study of the leaf age pattern of grapevines, combined with improvements in machinery and training system design, has shown that shoot trimming applied at fruit-set to retain 12 to 15 main leaves is the best method to achieve both canopy size control and maintain grape quality.

Here shoot trimming, or summer pruning in general, means external canopy manipulations designed to correct deviations from the desired growth habit, and considering their delicacy, many growers would be happy to do without shoot trimming.

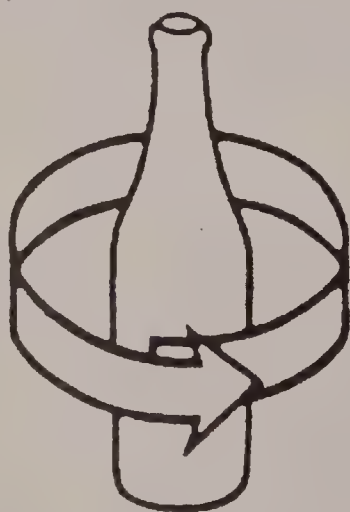
An ideal model of canopy growth would require a rapid fill early in the season, when environmental conditions do not usually limit photosynthesis, and a steady post-bloom decline in shoot growth to curb competition with the developing berries. The vegetative growth habit of hedged or minimally-pruned vines is a good model for such desirable features.

More troublesome is getting the same equilibrium in spur-pruned vines, where the lower crop associated with lower shoot number leads to an increase in vigor that has to be controlled (for instance) by summer pruning.

Whenever summer pruning is necessary, growers need to know if it can also be targeted to meet market demands for grape quality by correct-

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ing or improving specific must characteristics. A typical example of such an application can be found in a study by Solari et al. (1988), who reported a decrease in pH and potassium per berry without modification of the remaining must quality indicators from a light shoot topping (12 leaves per main shoot) at mid-stage I° of berry development.

The mechanism involved suggests that moderate and late lateral development, although potentially competitive with berry ripening, acted as an alternative sink for potassium allocation, thereby decreasing accumulation in the berry, whereas harmful effects on yield, fruit sugars, and acids were prevented, likely as the result of light topping severity.

Achieving satisfactory repeatability of the above response, however, requires more research. In general, the consistent genetic control of leaf ageing in grapevines is an advantage since the expected effects induced by summer pruning techniques can be forecast on a rather firm basis. However, a valuable step forward will be taken when whole-canopy information is integrated with the well-established, basic knowledge of the ageing pattern of single grapevine leaves. ■

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effective THINNING

by Andrew G. Reynolds,
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Controversy continues. The belief that low grape yields result in high wine quality refuses to go away despite much research worldwide that indicates quite the contrary. We now see many grapegrowers, at the behest of winemakers, thinning clusters at various times during the season to reduce crop size and allegedly produce higher wine quality.

In many cases, cluster thinning will most definitely increase wine quality, but sometimes not. The following will attempt to put thinning as a relevant cultural practice into some perspective. (This isn't a thorough literature review, as I've limited my citations to North American studies only.)

Thinning vs. pruning for crop control

In the early 1920s, Dr. Albert Julius Winkler did some pioneering research that defined how pruning and cropping influenced yield and growth of the grapevine. He summarized his findings in a 1934 bulletin that included 14 points.¹⁹ The main "take-home" messages from the 14 points were:

1) Increasing crop size per vine decreases capacity (vigor + crop potential);

2) Dormant pruning increases shoot vigor by concentrating growth into fewer shoots;

3) Increasing shoot vigor reduces fruitfulness, hence shoot number, crop size, and fruitfulness are highly correlated.

What does this mean? Well, it means that we need to regulate both vigor and crop size by pruning in order to mature fruit consistently. Moreover, we need to strike a balance between vegetative growth and reproductive growth if we are to be successful winegrowers.

Overcropping will not only reduce shoot vigor (hence vine capacity) but will also ultimately reduce yield and wine quality. But, before we address the topic of reducing overcropping by thinning, we need to discuss balanced pruning and shoot density.

Balanced pruning

The balanced pruning concept embraces one of Winkler's important points; that a large vine can carry more buds than a small one. N.L. Partridge in Michigan first examined this concept with Concord vines.⁶ He noticed that many vineyards contained a large range of vine sizes (Winkler's "vine capacity" in Michiganese) from 0.1 to 6.9 lbs of cane prunings per vine. By pruning the big vines lightly, and the small vines severely, the growth among vines became more consistent.

This concept was studied by Shaulis and colleagues in New York, where they refined the original balanced pruning formula for Concord¹⁶ and modified it to account for cluster size differences in Catawba,¹⁷ Niagara, Fredonia,¹⁶ and other varieties.

French-American hybrid varieties were widely planted during the 1950s

in the northeast states and Canada. They presented a new problem to grapegrowers because their basal buds were so fruitful. Balanced pruning by itself didn't work; their fruitful basal buds gave them a serious propensity to overcrop.

Added to this problem, the cluster size of many French-American hybrids (e.g. de Chaunac, Seyval blanc) exceeds 300g, and this merely compounded the fruitful basal bud situation. The consequence was that severe pruning of small vines often made them smaller due to the extra crop load imposed by the fruitful base shoots. Another crop regulation strategy was necessary to control crop and maintain wine quality.

Shoot density and balanced thinning

Research in New York in the early 1980s showed that a better approach to handling varieties with fruitful basal buds was to maintain a reasonable shoot density (four to six shoots/ft. canopy; 15 to 20 shoots/m canopy) and "balance thin" large-clustered varieties.¹¹ Hence, big and small vines carry the same shoot number, but small vines are more severely cluster thinned. In this manner, all vines theoretically carry the same leaf area, but weaker vines are encouraged to grow by limiting the crop-to-leaf area ratio.

Thinning at a glance

By thinning, we basically mean removal of clusters. This can be done any time during the season, but when it is done produces different effects.

Flower-cluster thinning is performed prior to or during bloom. It has the advantage of being fast, because the canopy is still being formed, and hence the clusters are very easy to see. You can also shoot-thin at the same time to remove excess fruitful and unfruitful shoots.

Keep in mind, however, that yield compensation is optimized by flower cluster thinning; by removing flower clusters, berry set is enhanced in the remaining clusters. This is simply an effect of reducing competitiveness between "sinks" — the thousands of individual flowers that make up the developing clusters.

Moreover, again due to reduced sink competition, berry size and weight

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tend to be greater at harvest in flower cluster thinned vineyards than in non-thinned vineyards. This may be detrimental if you are trying to maximize skin-to-juice ratios for purposes of color, tannin, and flavor extraction.

Another downside of flower-cluster thinning is that the clusters can get tighter, and hence, bunch rot can be a problem. Vine vigor may be stimulated and can, under some circumstances, create more canopy shade. We've often measured higher titratable acidity in fruit from flower cluster-thinned vines than from unthinned vines.^{11,12} Nonetheless, you will generally increase yield, vine size, vine hardiness, fruit soluble solids, flavor compounds, anthocyanins (color), and sometimes wine quality.

In varieties with cluster weights less than 150g, yield compensation is usually insufficient to overcome the decrease in cluster number, hence yields are often not increased, and in varieties such as Gewurztraminer, Pinot noir, and Riesling, yield can sometimes decrease.^{8,9,12,13}

Post-set thinning is more expensive than flower-cluster thinning, because the canopy is about three-fourths formed, and you need to fight with the vines to find the fruit. It's also usually more difficult to do any shoot thinning effectively at this time.

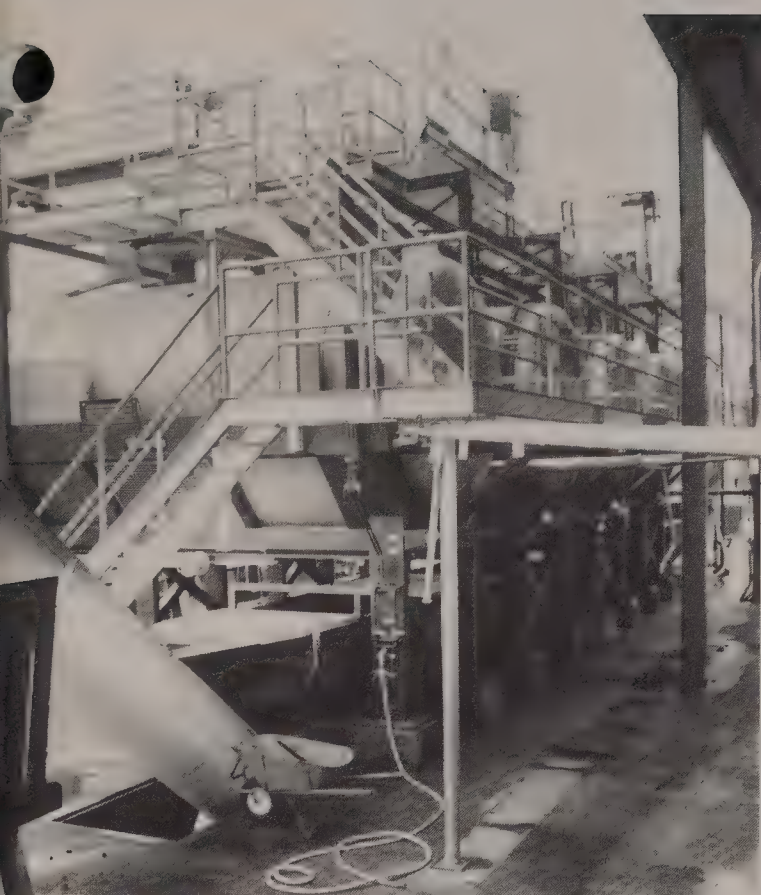
Hence, the process is somewhat less precise than prebloom-thinning. There is less yield compensation too. Berries have set, so berries per cluster don't increase. However, clusters that are retained are looser than those on flower cluster-thinned vines. As a result, bunch rot infection is lower.

Because you are thinning prior to veraison, you still will increase berry size and weight, since you are removing competing clusters during the cell division stage. Yield, soluble solids, vine size, and vine hardiness also increase. I have not seen data that indicate that wine quality is improved by post-set thinning over flower-cluster thinning, but anecdotal evidence seems to indicate that it is at least as effective. Note also however, that the longer one waits before thinning, the more berry size is reduced.^{11,18}

Veraison and post-veraison thinning are done more frequently in the industry now that red wines have

Winkler's 14 points

1. The removal of ... vegetative parts of the vine is depressing ... pruning of any sort at any time decreases the capacity [vine growth and hence potential yield] of the vine.
2. The production of crop decreases the capacity of the vine.
3. The vigor of individual shoots ... varies inversely with the number of shoots that develop.
4. The capacity of the vine varies [directly] with the number of shoots that develop.
5. Vigor of the shoots ... varies inversely with the amount of crop.
6. Fruitfulness of the buds ... varies inversely with the vigor of [the] shoots.
7. A ... vine can properly nourish and ripen only a certain quantity of fruit, that is, its capacity is limited by its previous history and its environment.
8. The fruitful buds of the vine occur most abundantly on one-year-old canes which arise from two-year-old wood.
9. The more erect a shoot, cane ... the more vigorously it will grow.
10. The shoots farthest from the trunk ... are the most vigorous.
11. Canes with internodes of medium length usually mature their wood best and have the most fruitful buds.
12. A large cane or arm or vine is capable of greater production than a small one and therefore, should carry more buds.
13. Well-matured canes have the best developed buds.
14. By bending or twisting, the behavior of canes or shoots may be modified for the purpose of regulating growth or fruiting.



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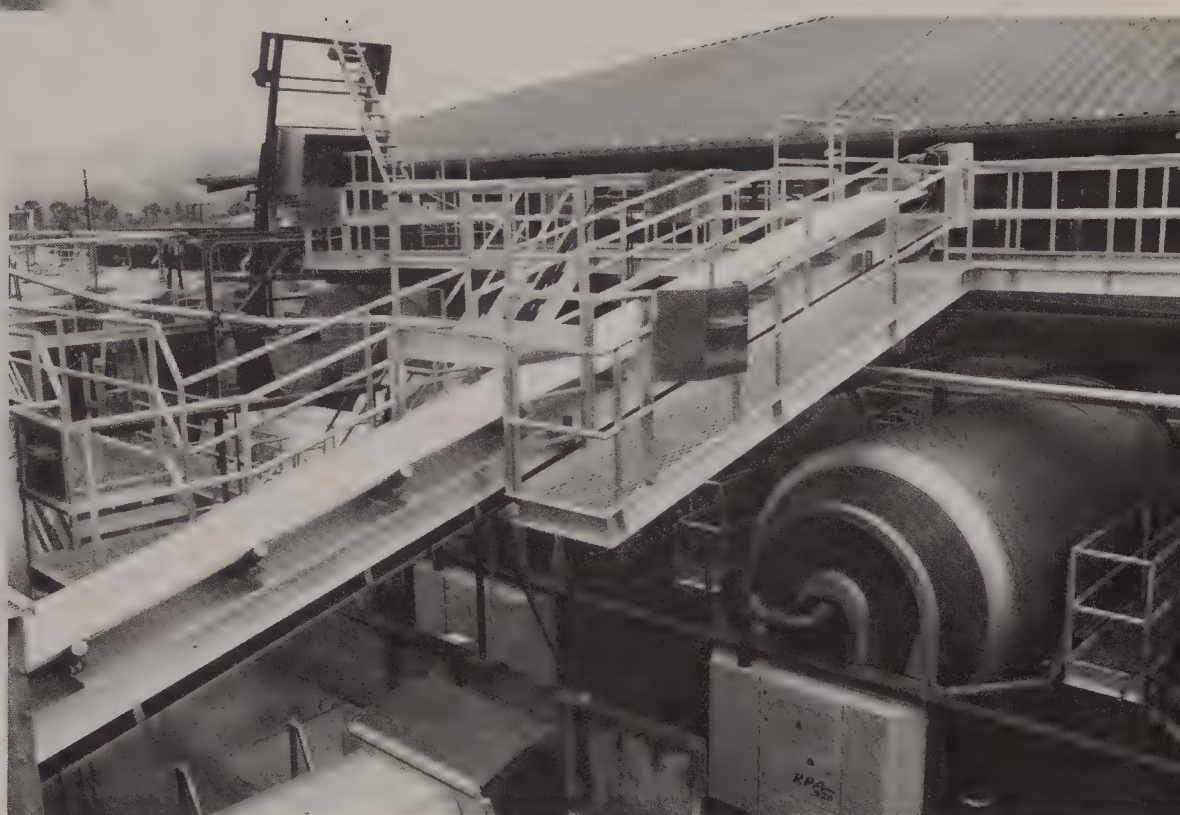
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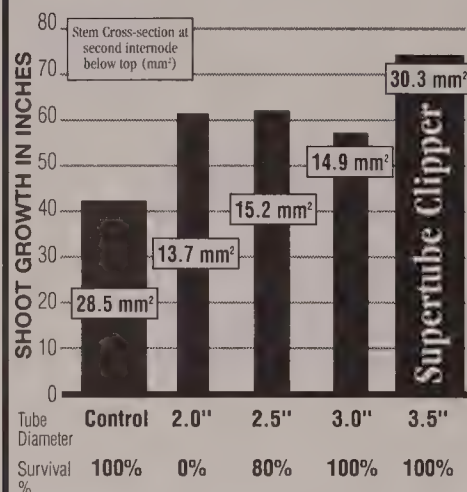


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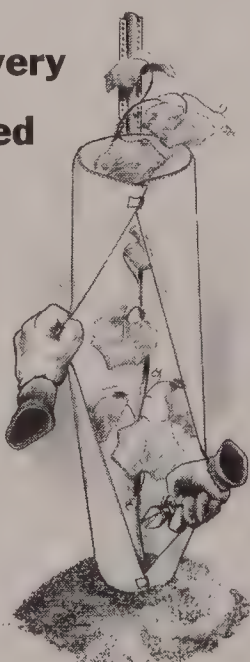
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WINEGROWING

become more popular. This has minimal impact in terms of yield compensation; in fact, yields per vine are usually reduced in all but the largest-clustered varieties such as Chancellor. And, it's usually done on overcropped vines where berry size is potentially low anyway. This, therefore, is a true bandaid solution to an overcropped vineyard. Nonetheless, thinning out green clusters at 90% veraison or shortly thereafter will make the crop ripen more evenly.

Not only is it minimally effective, it's very expensive. You are spending money on labor and losing yield. If you consider post-veraison thinning, be very sure that it will be effective. Remember, the longer past veraison you wait, the less effective the practice becomes.

The benefits? The remaining crop is allowed to ripen. Wine quality should improve. Yield goes down. Vine size is unaffected. Vine hardiness is also probably unaffected, based on the data collected so far. If you need to do this every year, you would be well-advised to review your fertilization and soil management practices (*i.e.*, Are your vines too low in vigor?) and your pruning practices (Could you be leaving too many buds?).

Making the decision

We've discussed the roles and uses of thinning and pruning for controlling crop. How each practice is used must be based upon accepting the concept that *balance* between vegetative and reproductive growth (*i.e.* vine size and crop size) in the grapevine is essential for high wine quality.

For reductionist thinkers, balance is indicated by mean cane weights of 25 to 40g, cane pruning weights of 0.3lbs/ft. canopy (0.4kg/m canopy), and crop loads (crop size:vine size ratios) greater than 5 but less than 12. Some of our data with Chancellor and Seyval blanc trained to Geneva Double Curtain seem to increase the crop load ceiling to 17 or more.

Balance may mean something like two tons per acre at Chateau Margaux, but in excess of 10 tons per acre in some vineyards in California, the Pacific Northwest, and other "New World" winegrowing districts. Thinning can help us achieve that balance.

So, when should you thin? Take your cue from four main scenarios:

1. Thin to reduce a potential overcrop situation in a specific year, due to climatological conditions the previous year. For example, high fertility in buds formed in many northwest vineyards in 1992 (due to high light conditions during and following bloom) led to huge crops in 1993. Even though vines were treated (pruned, etc.) as usual in preparation for the 1993 season, we needed to thin some varieties to prevent overcropping.

2. Thin to maintain consistent yields and winegrape quality in varieties with very fruitful basal buds, secondary buds, and tertiary buds. In most cases, this may involve cluster thinning, but may also require shoot thinning if shoot density becomes too high. This is especially true with cordon-trained, spur-pruned vines.

3. Thin to avoid overcropping in large-clustered varieties. This pertains especially to hybrids such as Chancellor, de Chaunac, Seyval blanc, and Verdet. We also routinely thin all our table grapes to one cluster per shoot. Large-clustered *Vitis vinifera* varieties such as Cabernet Sauvignon and Merlot also benefit from annual cluster thinning due to their propensity to overcrop.

We are assuming that vine size is average to low; if we adhere to the balanced-thinning concept, little thinning will be required on vigorous vines. On small vines (made smaller by severe pruning in the absence of thinning), thinning must be more severe to achieve a suitable balance between leaf area and crop retained.

4. Thin to get the crop to ripen in a bad year. If the weather is lousy mid-to late summer, and you know the snow falls in October (or even if it doesn't), you may decide to thin some crop on the late varieties. Granted, there's a certain amount of crystal ball gazing for this one, but let's face it, if your eight-ton per acre crop of Riesling is little marbles on September 1, think about pulling some crop off.

Some case studies

I have specifically not made any recommendations on how much to thin, because that is something that varies with variety, site, and situation.

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However, a few case studies, taken from both research and industry, should provide some guidelines. (Thinning is also effective in *Vitis labrusca* varieties,² but I'll confine my discussion here to *Vitis vinifera* and French-American hybrids.)

French-American hybrids

De Chaunac — K.H. Fisher and colleagues in Ontario, Canada, showed that flower-cluster thinning this variety to one cluster per shoot increased vine size, yield, and fruit soluble solids. This variety is not grown much anymore, but this work is significant in that the effects were consistent over a very long period.

Some of our work in British Columbia confirmed this^{4,7} and also showed increases in anthocyanins with thinning.⁷ Furthermore, we were able to show how ineffective balanced pruning was in the absence of cluster thinning. In fact, balanced pruning seemed totally useless; vines on which all "count" nodes were removed (leaving base buds and bare cordons only) yielded as much as conventionally-pruned vines. Thinning was the only effective mode of crop regulation.

Seyval blanc — Work I did in New York with Bob Pool and Len Mattick showed that this variety needed a fixed shoot density and balanced thinning to minimize bunch rot and optimize yield, vine size, winter hardiness, and wine-grape quality.¹¹ We set up nine shoot-density and flower-cluster thinning combinations, but also looked at post-set thinning as a vehicle for reducing bunch rot (it worked).

The best combination of treatments appeared to be four to six shoots/ft. canopy and 17 clusters/lb. cane prunings. This assumed "average" vines (2.5 lbs. cane prunings/vine) would be thinned to 1.5 clusters/shoot, less vigorous vines to one cluster/shoot, and very vigorous vines to two clusters/shoot. Vine size at thinning time can be estimated roughly by trunk diameter and shoot length. You obviously don't need to weigh all your vines to figure out a thinning strategy.

Vitis vinifera

Cabernet sauvignon — In areas where Cabernet is difficult to ripen, I recommend cluster thinning. I will

admit that this is based on gut feeling rather than solid numbers. Interestingly, in the Napa Valley, a study by C. Ough and R. Nagaoka showed that cluster thinning down to one-third the original crop had minimal impact on fruit composition and wine quality.⁵ The take-home message again is justifying crop loss plus labor cost against potential increase in wine quality.

Gewurztraminer — When we began looking at terpene flavorants as a quality index, we decided to include cluster thinning as a treatment in our first trial.¹³ As with many previous studies, fruit soluble solids increased and so did free and bound terpene flavorants. We unfortunately couldn't link this to wine quality.

Pinot noir — A recently published study conducted by Oregon State University in cooperation with Agriculture Canada looked at cluster thinning in combination with different shoot densities and Scott Henry training.¹² Cluster thinning essentially removed half the potential crop; we did flower-cluster thinning, and Steve Price and colleagues waited till after fruit set.

There weren't any major surprises; cluster weight, berry weight and berries per cluster went up at our site, yield decreased slightly, and fruit composition was improved. Wine quality also was increased, but only if shoot density and fruit environment were optimal.¹⁴ Thinning had no impact on wine quality when shoot density was 20 shoots/m canopy. That's another thing worth noting: cluster thinning is a complement to, and not a replacement for, good viticulture.

Daniel Roberts of Sterling Vineyards (Calistoga, CA) reported on some thinning research with Pinot noir conducted by his winery in the Carneros region.¹⁵ I was fortunate to taste the wines from the treatments, and there was a marked improvement in the two thinned treatments over the control. The most severe thinning produced 2.5 tons per acre, which was considered uneconomical.

Riesling — The cynics will say that quality doesn't matter for Riesling because it won't sell anyway. Informed growers know otherwise. We found in a small trial in the mid-1980s that wine quality in Riesling could be improved by flower-cluster thinning, along with

vine size, soluble solids, and yield consistency.⁸ It was not so much a function of yield per vine *per se* as much as it was balance and crop load; Rieslings with crop loads yield:pruning wt. ratios between seven and ten gave us highest aroma intensity.

We carried this study further to look at multiple-shoot density and cluster-thinning levels and found that 26 shoots/m canopy was optimal in terms of combining profitable yields with highest wine quality, and cluster thinning could be used to manipulate fruit composition and wine quality somewhat.^{9,10}

At 16 shoots/m, the shoots were more vigorous, leaves were larger, and more fruit was in the shade. Yields were lower too, but vines were over-vegetative, and cluster thinning made no difference in wine quality. Way up at 36 shoots/m, cluster thinning also made no difference; removing crop could not overcome the problems created by a dense canopy.

These wine quality differences were supported by differences in the concentrations of aroma compounds in the wines. This again illustrates the point that cluster thinning cannot be used as a replacement for good viticulture.

Some final thoughts

From these observations, we come to several conclusions:

1) There is no single time of the year or severity of thinning that can be recommended; thinning, like all horticultural practices, is site and variety-specific.

2) Thinning can be used as a regular part of a viticulture program or as a special tool in unusual seasons.

3) Thinning will have desirable consequences regardless of when it is done, but it will have different effects depending on the time of year when it is implemented. Also, thinning has little effect on fruit composition if performed following veraison.

4) Thinning is effective in improving yield, fruit composition, vine size, hardiness, and wine quality, but has minimal impact under conditions of poor vineyard management. ■

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Continued on page 86

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by Eleanor & Ray Heald

In Burgundy during the Middle Ages, a mutation of Pinot Noir probably produced Pinot Gris. According to wine historians, the French began producing White Burgundies from Pinot Gris in the 14th century. From France, vine cuttings were first carried into Switzerland and from there throughout central Europe.

By the 18th century, a Pinot Gris vine ended up on the German Palatinate property of Johan Ruland. In his honor, the grape was christened Rüländer. Pinot Grigio is the name attached to the variety in Italy, and is becoming a popular moniker in California. David Lett, owner of Eyrie Vineyards (Oregon), was the first to plant Pinot Gris in the U.S. in 1965.

Today, plantings of Pinot Gris are increasing faster than any other varietal in Oregon. Acreage has multiplied more than tenfold from 69 acres in 1984 to well over 878 acres in 1995, making it the third most widely planted varietal in the state.

The 583 cases of 1994 Navarro Vineyards Pinot Gris, produced from a 3.5-acre site in the western end of Anderson Valley, represent about 1/5 of California production. Navarro's winemaker Jim Klein credits Alsace producers with doing the best job in expressing fruit and complementing the wine with good acidity, sugar, and mouthfeel. He praises Oregon producers for providing information about the frailties of Pinot Gris and the detrimental effects of using Chardonnay winemaking tricks.

Klein believes Pinot Gris loses fruit and finesse with malolactic fermentation (MLF), excessive new oak, and barrel fermentation. His views, however, are only partially shared by other domestic producers, some of whom, subscribe to barrel fermentation, principally in neutral oak, and use MLF not only to lower acidity, but to add complexing flavors and enhanced mouthfeel.

In the U.S., there is growing interest in the varietal as a cool climate white. While *PWV* investigated Pinot Gris production parameters from many domestic producers, we conducted a round-

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Yamhill Valley Vineyards, McMinnville, OR



table discussion and tasting with Oregon winemakers Rich Cushman (Cooper Mountain), Adam Campbell (Elk Cove), Joe Dobbles (Hinman Vineyards/Silvan Ridge), Lynn Penner-Ash (Rex Hill), and Stephen Cary (Yamhill Valley). Comments from all interviewed participants can be found under the production section below.

Aromas and flavors

Lynn Penner-Ash describes Pinot Gris as spicy. She says consumers confuse this spicy character with oak. "It's also slightly nutty with some cinnamon characteristics, and depending on where it's grown, it can have definite ripe pear notes," she adds. "Pinot Gris descriptors are a function of soil type and vineyard elevation."

Joe Dobbles adds vanilla and cream to both the aromatic and flavor profile. In addition to spice, he suggests apple and citrus and echoes pear. He maintains that consumers also



attribute the vanilla character to oak, but it stems from the fruit or perhaps from lees contact.

Rich Cushman looks for orange peel, citrusy notes, ripe pear, melon, and cantaloupe, as well as an underlying creaminess without palate flabbiness.

"I think it's important to remember that Pinot Gris is a member of the Pinot Noir family and has many similarities to Pinot Noir," Stephen Cary explains. "To me, this means that it's subtle and not a powerfully expressive varietal. There are delightful hints of aromas in direct contradiction to Sauvignon Blanc, for example. I prefer subtle wines with complexity."

Cary adds anise to the list of descriptors and places it in the same family with citrusy characters. He notes that he does not find bigger, bolder fruits such as pineapple in his Pinot Gris.

Dobbes adds that the wine's aroma profile is dependent upon picking time,

vineyard site, as well as fermentation regime. "I'm deliberately steering my wines toward the tropical end of the spectrum," he says. "Pinot Gris is a lot like Chardonnay in that it's a winemaker's wine. A style can be groomed both in the vineyard and the cellar."

Soil vs. elevation

Cary explains that he has soil mixing on the property at Yamhill and that until recently, all Pinot Gris in Oregon is own-rooted. He believes that for Pinot Gris, soil type is not nearly as important as soil depth. At Yamhill Valley Vineyard, "soil depth is largely governed by altitude, so it's possible to discuss elevation and cover the gamut," he stresses.

Dobbes buys Pinot Gris grapes from about nine different sites and soil types are all over the board. He does not consider this a negative, because it offers complexing elements that he seeks. He does believe that the best fruit, no matter

what the variety, comes from the shallowest, less vigorous, and rocky soils.

Picking parameters

Depending on the year and site, Pinot Gris in Oregon is picked between early and late October. Participants state a wide range of Brix levels at harvest from 19° to 24°.

Dobbes explains this as a vintage variable. "In 1994, we had a vineyard that only got to 19° Brix," he illustrates. "The vineyard is at an elevation of 900 feet; perhaps just a little too cool. There was a late growing-season rain and secondary berries started to grow. We had green and ripe berries on the same cluster."

Dobbes likes the Scott-Henry trellis and maintains that he gets simultaneous ripening in both fruit zones. Again, a survey of participants found trellising all over the map.

At Cooper Mountain Vineyards, Cushman prefers to pick at 22.5° Brix because that's where he gets the orangey-citrus and pear flavors he likes and alcohol levels are moderate. The acidity is balanced, and he does not need to consider acid manipulation techniques.

Adam Campbell says that in some years Pinot Gris may reach appropriate Brix but can benefit from hanging on the vine seven to ten days longer. Sugar levels may not elevate, but there is a significant improvement in flavors and slightly lower acidity levels.

In 1991, Cary experimented and left several tons of grapes hanging for an additional 12 days. When picked, grapes came in with virtually the same sugar as those harvested earlier. Acids went down, but flavors were boring. "It was as though the grapes oxidized on the vine," he explains. "I'd like to find extra hang time valuable, but at our site it isn't the case. I think the vines shut down."

In general, Oregon producers are getting yields of 3 to 3.5 TPA, but Cary says due to thin soils, and maybe viticultural practices, Yamhill Valley Vineyards never yields over 1.7 TPA.

Phenolic composition at harvest

Cushman believes that any bitterness perceived in Pinot Gris is a skin component. Other participants agree that bitterness is inherent in the varietal.

VARIETAL REVIEW

In 1994, grapes and juice used for the Cooper Mountain Reserve wine had a pink color. "There's nothing we do that would promote color," Cushman maintains. "We crush lightly and there's no skin contact. Yet, we ended up with a faint bronze color that is not an oxidized character."

Based on this, Cushman believes that there is a point in grape ripeness where some color or extract from the skin is delivered to the juice. "I don't know if this should be encouraged." He reports a yield of 140-145 gal/ton and press fractions are not separated.

Cary gets color in the juice every year and views coloring as a measure of ripeness. Everytime he tastes what he's looking for in ripeness, there is a little color in the juice. In 1991, Cary received a letter from a Chicago lawyer who accused him of fraud. He was sure that red wine had been added. "I invited him to come to the winery the following October and watch the pink juice run," Cary recalls.

Procedures followed in the winery after pressing have a big effect on dropping color. Cary includes extended lees contact, MLF, and SO₂ additions. "But I don't want to drop color," Cary maintains. "Our marketing shows that consumers like color in Pinot Gris and appreciate it."

Cary does not liken this coloration to pinking. "Given the pH of Pinot Gris, I'm not looking for a pink-bronze color to go brown in a hurry," he adds.

Dobbes purchases grapes grown on three or four different trellis types. Geneva Double Curtain (GDC), especially in warm years, offers more sun exposure to fruit and the skins are much more bitter. He attributes this to sunburn. "Sun-exposed fruit develops thicker skin," he explains. "With this particular vineyard, there is no leaf stripping. With other vineyards where leaf removal is done, it's on the east side, never on the west, and the fruit is coming off more delicate with less phenolic character."

"The pinot component of Pinot Gris prescribing gentle handling in the winery and vineyard can't be neglected. It affects final wine quality. Without recognition and proper handling of some inherent phenolic problems, Pinot Gris will lack finesse and develop bitterness in the bottle within six months."

Choice of fermentation vessel

Penner-Ash prefers fermentation in neutral barrels because of the juice to lees contact ratio. At Rex Hill, lees are stirred weekly for two to four months, depending on the development of complex tastes.

Why not use stainless steel drums to accomplish the same thing? "I believe there is a small oxidative process and maturing that take place in a barrel," she answers. "This doesn't happen in stainless. I tried new wood in 1988 and now know it's not appropriate for Pinot Gris."

Cushman prefers tank fermentation with extended lees contact in the tank

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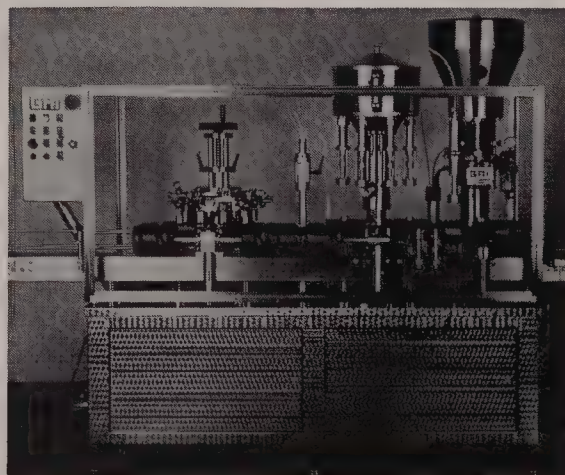
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because he believes the wine is fresher. "There is a loss of brightness, which I look for, when fermentation is done in barrels," he notes.

Dobbes chooses the same route as Cushman and uses a Guth mixer to turn lees over.

Fining

Penner-Ash uses potassium caseinate when needed to fine out bitterness. She says it also adds a bit of complexity to the mid-palate. She tried isinglass and did not like it.

Cushman sticks with bentonite and, if there's a bitter edge to knock off, chooses casein. "But I don't want to give the impression that phenolic bitterness is a big issue with Pinot Gris," he contends. "For me, the slight bitterness is a valuable complexing component that I'm delighted to find in the wine. Pinot Gris offers an alternative to Chardonnay because it's a delicious, firm-toned wine and one that more easily harmonizes with food than Chardonnay."

Freshness

The winemakers generally agreed that today's consumer is attracted to the freshness of a young white wine. Related to this is the issue of dissolved CO₂.

"You can get rid of dissolved CO₂ or keep it," Penner-Ash comments. "In our present bottling format, we cannot have dissolved CO₂. There would be a mess everywhere because the corker doesn't pull a sufficient vacuum. I have to make certain that the wine is warm enough (60°-65°F) and sufficiently stirred before it goes to the bottling line."

Dobbes goes the other way. He bottles Pinot Gris at the end of July, which is later than many other Oregon producers. "I actually kick up CO₂ levels slightly," he explains. "If I find a wine that's a bit flabby or flat, we give it a shot of dissolved CO₂, and it brightens up the wine immediately. We've been criticized sometimes for too much spritz on the tongue and maybe we've overdone it a little. We're still trying to establish the

best parameters for our wine."

Cushman doesn't encourage dissolved CO₂. He mixes his tanks with nitrogen to adsorb CO₂ and purge it.

Cary definitely wants a modest level of dissolved CO₂. "I don't trust my carbo-doser, and I'm still searching for a way of quantifying what my palate likes," he says.

Ageing

Penner-Ash contends that Pinot Gris is released too early. "We're putting it to bottle and having to release it four weeks later," she says. "The wine can be significantly better six months to a year later. It needs bottle time. With the Rex Hill Reserve Pinot Gris, we're not releasing until it's at the stage where I enjoy drinking it."

She mentions the learning curve Oregon producers are on with respect to Pinot Gris production. "I recently retasted Rex Hill's Pinot Gris from the late 1980s," she notes. "They were flat, dead and over-oaked. But the 1990 and

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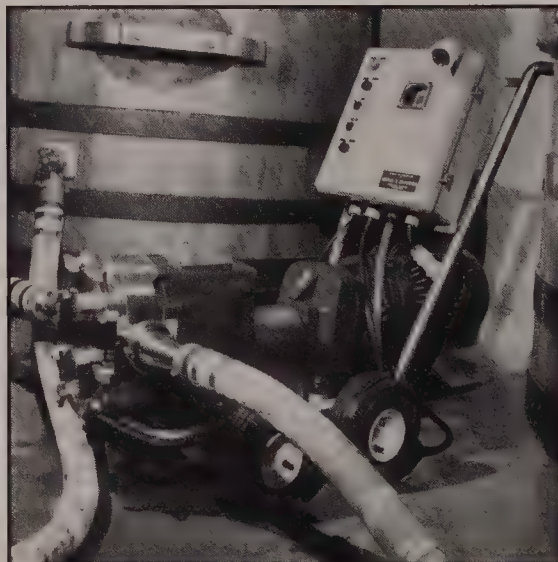
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1991 are alive. I attribute this to learning where we wanted to be stylistically with Pinot Gris."

PWV thanks Rex Hill for hosting the tasting/discussion.

Pinot Gris wine production

Cooper Mountain Vineyards

Beaverton, OR

Rich Cushman, winemaker

Style

Pinot Gris can be a very vivacious wine with bright orange peel, ripe pear, and melony fruit. It has solid depth and intriguing complexity. Cushman tries to bring these qualities forward. He says he does not allow winemaking techniques, such as barrel fermentation or MLF, to get in the way of exceptional fruit quality derived from the vineyard.

It is Cushman's belief that Pinot Gris from a good vineyard site has adequate but low acidity. If this wine undergoes MLF, fruit character is diminished and the wine loses its liveliness.

Grapes are picked between 21.5° and 23° Brix. Bunches have even ripening, and berries are well-flavored with modest acidity.

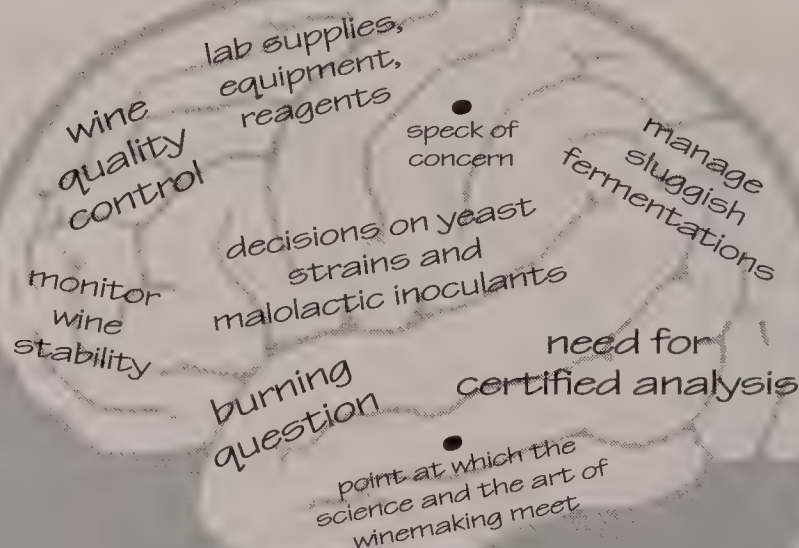
Winemaking

Juice is settled 36 hours at 50°F before inoculation with Prise de Mousse ADY. Both DAP and Fermaide are added as yeast nutrients. SO₂ at 30ppm is added at the end of fermentation.

To enhance a creamy texture and to improve longevity, the wine is aged on the lees for approximately four months. Lees are gently stirred with nitrogen weekly.

After completion of lees ageing, wine is racked, then fined with bentonite for heat stability and given a top fining with a low level of casein for clarity. In February or March following harvest, wine is polish-pad filtered and sterile filtered with a 0.45μ membrane into the bottle. Release to market is in four to six weeks.

Each year, a small Reserve bottling from the oldest vineyard block is done. This grape source has low crop levels of 1.0 to 1.5 TPA and higher sugar levels, around 24° Brix. Winemaking is



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the same as the regular bottling except the wine is given seven to eight months bottle-ageing before release. The wine is more viscous with deeper flavors, and there is a desired slight bitterness on the finish.

Elk Cove Vineyards

Gaston, OR

Joe Campbell, winemaker

Style

Production of a rich, full-bodied wine with good fruit and a dry finish is the goal. Estate vineyards yield fruit with pronounced, yet delicate flavors and low polyphenols.

Based on flavor profile, grapes are harvested between 22.5° and 23° Brix.

Winemaking

Prior to inoculation with liquid Chanson and active-dry Prise de Mousse yeasts, juice is settled for 24 hours.

Tank fermentation completes in 15 to 30 days, and the wine is racked off the lees. The first SO₂ addition of 30ppm is added at filtration. Wine is bottled in February or March and released in four to six months.

Good Harbor Vineyards

Lake Leelanau, MI

Bruce Simpson, winemaker

Style

Clean fruit flavors with light oak, yeast, and malolactic characters in the background are desired.

Grapes are harvested between 19° and 21° Brix. TA is in the range of 0.9 to 1.1 with 3.0 pH.

Winemaking

Inoculation (after racking off heavy solids) is done with various active-dry yeast strains.

Fermentation begun in tank is transferred at 6° Brix to 60-gallon four-year-old French oak barrels. To soften higher northern Michigan acidities, juice is inoculated in tank with OSU or Chr. Hansen ML bacteria.

Fermentation completes in seven to 10 days, and the wine ages on light lees for four months with monthly stirring.

The first SO₂ addition is made after MLF completion. Concentration de-

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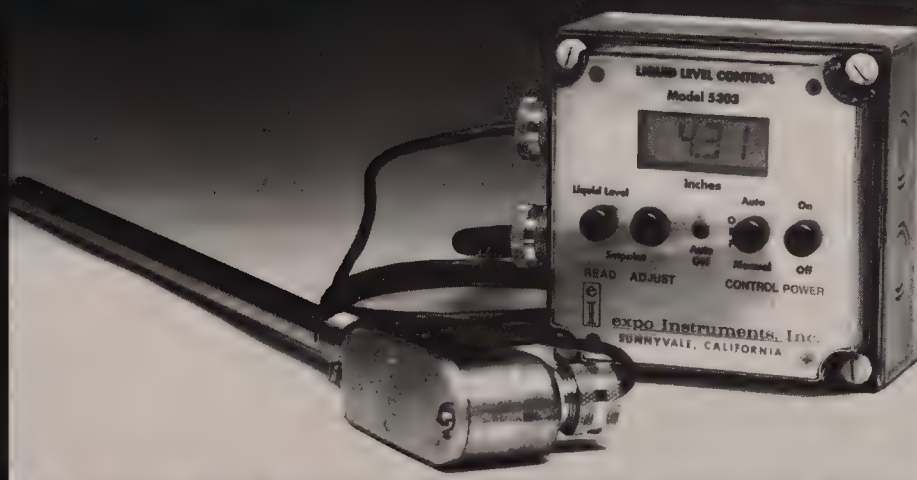
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depends on pH of the wine.

Before bottling in early summer, the wine is racked and given a polish-pad filtration. The wine is bottle-aged one month before release.

Hinman Vineyards/ Silvan Ridge Winery

Eugene, OR

Joe Dobbles, winemaker

Style

Silvan Ridge is the reserve label of Hinman Vineyard. The focus of Pinot Gris under both labels is fruit emphasis in the pear, melon, and tropical fruit spectrum with crisp acidity. Wines are styled to be full, clean, lively, and rich without natural fruit bitterness. Depending on the vintage, the wine may undergo partial or full MLF.

Based on fruit flavors, grapes are generally harvested at 22.5° to 23.5° Brix. Basal leaves show yellowing and stems are drying off.

Winemaking

If possible, whole clusters are pressed to reduce a bitterness potential and to lower pH. Juice is settled one to three days at 45°F before inoculation with 71-B ADY.

Tank fermentation at 55°F completes in four to eight weeks. About half to 75% of the wine undergoes MLF to build richness, roundness, and overall enhanced mouthfeel.

To decrease bitterness, increase mouthfeel, and add to the ageing potential, all wine is aged on gross lees for seven months, and stirred once or twice monthly.

Once MLF completes, 60ppm SO₂ is added.

In May, and depending on the wine and trial results, fining is done with one or combinations of the following: PVPP, isinglass, casein, or bentonite at two to four lbs/1,000-gal. In two to four weeks, the wine is racked off the fining agent and given a DE filtration. Wine passes through a sterile membrane to the bottle in June or July. The 1994 bottling was unfiltered to preserve mouth texture, richness, and delicate fruit which show better earlier after bottling.

Wine is bottle-aged six months before release.



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King Estate

Eugene, OR
Will Bucklin and Brad Biehl,
 winemakers

Style

The winemakers believe that Oregon Pinot Gris can be "consistent in showcasing classic cool climate attributes," and they strive to have this delivered in the wine's fruit, spice elements, and mouthfeel.

Orange blossom, tropical fruits, citrus, pears, and a spice melange are evident in the aroma with flavors of fresh pears, lemon, nutmeg, and anise spice. The wine is rich and round in mouthfeel.

Grapes from 30 different locations are harvested based on flavor at about 22.5° Brix. The Reserve wine is a blend of lots highlighting the most intense and lush varietal characters. Selection for a Reserve bottling is made post-fermentation and ageing.

Winemaking

To reduce both color and phenolics, whole clusters are pressed. Juice is settled at 50°F for 24 hours before racking followed by inoculation with VL-1, D47, and Prise de Mousse ADY.

Juice is tank-fermented until dryness (about 15 days) at 55° to 60°F, and then the first SO₂ addition is made. Between 5% and 20% of the wine may be transferred to 900-gal neutral cooperage for about one month. To enhance overall mouthfeel, flavor, and color, some wine fractions are aged on the lees. The free SO₂ is maintained at 20ppm.

When needed, the wine is fined and filtered off bentonite lees. It is bottled in March and bottle-aged five months before release.

L. Mawby

Suttons Bay, MI
Larry Mawby, winemaker

Style

Since Pinot Gris ripens reliably in Michigan with balanced sugar, acid, and pH, a straightforward style reflecting both the vineyard and vintage character is desired.

Harvest judgments are based on TA. Picked at 1.0 to 1.3 TA, sugar levels are 20° to 21° Brix.

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VARIETAL REVIEW

Winemaking

Pressed juice is inoculated immediately with CY3079 ADY. Fermentation is started in tank and after one day, juice is transferred to three to five-year-old French cooperage. After fermentation completes in 14 days, wine is inoculated with vinoflora oenos ML strain. Once MLF completes, SO₂ is added at 40ppm.

To increase body, complexity, and smokiness, wine is aged on gross lees, stirred once or twice, for six to seven months. During the barrel regime, free SO₂ levels are maintained at 25 to 35ppm.

Wine is racked once and given a polish filtration before bottling in June. It is marketed immediately.

Navarro Vineyards

Philo, CA

Jim Klein, winemaker

Style

Because of success in Anderson Valley with other Alsace varieties such as Gewurztraminer and Riesling, it was decided after extensive tastings, to produce Pinot Gris. After three years experience with the variety, Klein believes he is just now beginning to understand its capabilities and is continuing to define a style that is still in its infancy.

The wine is crisp and minerally with subdued fruit aromas hinting of hazelnut and yeast. It is not an Alsace style, neither is it a Pinot Grigio in the Alto Adige style. Klein stresses it is an evolving style from California's Anderson Valley.

Fully ripe Anderson Valley Pinot Gris grapes are light purple and contain rich nutty and vanilla flavors with some pineapple. The most striking element is the delicate flavor coupled with incredibly bitter skins. Controlling astringency while extracting maximum flavor is perhaps one of the most critical issues facing Navarro in Pinot Gris production, hence Navarro exclusively whole cluster presses Pinot Gris.

At harvest, sugars measure 23.4° to 24.2° Brix.

Winemaking

Juice is settled 40 hours at 55°F, then racked and inoculated with Epernay 2 ADY and Fermaide yeast nutrient added.

Fermentation begins in tank and is moved at 10° Brix to 650 to 850-gallon French or German ovals to finish fermentation in 30 to 40 days. Once complete, 50ppm SO₂ is added. Free sulfur at 25ppm is maintained and MLF is discouraged.

The wine ages on the lees for six months without stirring.

This fermenting and ageing strategy is intended to highlight Pinot Gris fruit and layer in yeasty and toasty flavors with a hint of oak. The subtle hazelnut and vanilla fruit of Pinot Gris do not seem to blend well with other varieties.

The wine is racked clean off lees in April, blended and fined with silverleaf gelatin, bentonite as needed, and kieselsol. It is cold-stabilized for 12 days, then DE filtered. The bottling filter is EK.

In 1994, the wine was released six weeks post-bottling, but all succeeding wines will get six months bottle-ageing before release.

Ponzi Vineyards

Beaverton, OR

Richard and Luisa Ponzl, winemakers

Style

From cool sites, a dry-style Pinot Gris with crispness, good fruit, a little CO₂, and creaminess is desired.

The wine is a blend from two vineyard sources, one of which is cooler than the other with older 25-year-old vines. Creaminess stems from the latter source.

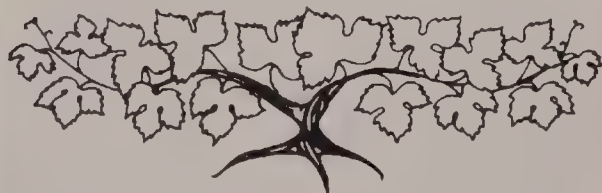
Grapes are harvested based on flavor between 22° and 23.5° Brix when leaves are yellowing slightly.

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Winemaking

Settled overnight, pressed juice is settled and racked, and inoculated with a proprietary ADY.

Tank fermentation at 55°F completes in 25 to 30 days. MLF is uninoculated and completes at 100%, softening some of the sharper acidity and adding to the wine's creamy texture. Once MLF completes, 35ppm SO₂ is added.

For enhanced texture and flavors, the wine is aged on the lees, without stirring, in tank for two months.

The wine is bentonite-fined, bottled in March, and released in two months.

Rex Hill Vineyards

Newberg, OR

Lynn Penner-Ash, winemaker

Style

The goal at Rex Hill is to create a wine that is complete from start to finish. It must have rich, ripe fruit flavors with a creamy, weighty mid-mouth that enters

into the finish with grace and leaves the taster with a complete experience.

Mature fruit develops ripe pear and honey flavors with a spicy-vanilla note. Acids maintain a nice balance without acidulation. These characters develop when sugars are 21.5° to 23.5° Brix, leaves are yellowing, and stems are browning.

Winemaking

Settled for 24 hours at 35°F, pressed juice is racked and mixed with juice from filtered lees, and inoculated with Prise de Mousse or VL-1 ADY. Fermaide is added as a yeast nutrient. Juice is transferred to 60-gal French oak barrels that are six to seven years old. Fermentation completes in 10 to 15 days.

To expand the mid-mouth impression, ease into the finish, and sometimes soften bitter edges, some lots are inoculated at 10° Brix with OSU ML strain to initiate MLF. Fifteen percent of the final blend will have completed MLF.

Wine remains on gross lees, stirred weekly, for two to four months. Wine is racked from barrel and 30ppm SO₂ added.

Potassium caseinate and/or bentonite are used as fining agents. Wine is racked after two weeks cold stabilization and filtered with 100/EKS before bottling in March. Prior to release, (barring market constraints), the wine is bottle-aged two months.

Tyee Wine Cellars

Corvallis, OR

Barney Watson, winemaker

Style

The wine, a blend from three vineyard sites, emphasizes inherent Pinot Gris varietal characteristics with well-ripened fruit, without barrel ageing or MLF.

Grapes are judged for ripeness by aroma and flavor development. When picked, sugars are 22.5° to 23.5° Brix.

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Winemaking

To increase varietal character intensity, there is two to four hours skin contact before pressing. Juice is treated with 25 to 35ppm SO₂ and settled 18 hours at 50° to 55°F before inoculation with Prise de Mousse ADY, VL-1, and K-1 yeasts.

Tank fermentation at 68°F completes in 45 days. Wine is in contact with unstirred lees for six months.

A bentonite fining is done, followed by rough, polish, and finally sterile filtration into the bottle, nine to 10 months post-harvest. Wine is aged three to six months before release.

Yamhill Valley Vineyards

McMinnville, OR
Stephen Cary, winemaker

Style

The estate vineyard source for Pinot Gris has persistently low yields of 1.7

TPA, resulting in intense fruit flavors. The wine is bright and crisp with fresh fruitiness.

Based on flavor and overall ripeness, grapes are harvested between 21° and 23° Brix with 0.9 TA or less.

Winemaking

The juice is inoculated with a variety of ADYs. Superfood is added as yeast nutrient.

Tank fermentation at 58° to 65°F completes in 10 to 30 days, and SO₂ is added in an amount depending on the pH. A blend fraction which completes MLF is filtered back to the major fraction that does not undergo MLF. The wine is aged three months on unstirred gross lees.

In late winter or early spring, fining with bentonite is done pre-bottling, after cold stabilization. Wine is coarse- and fine-DE filtered followed by a sterile membrane filtration into the bottle. Release is four to six months post-bottling. ■

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Harmonizing flavors with PINOT GRIS

by Eleanor & Ray Heald

Publishing a cookbook showcasing Pinot Gris' potential as a complement to food was a natural for King Estate Winery, Eugene, OR. The winery is committed to growing and producing Pinot Gris.

King Estate culinary director Stephanie Pearl Kimmel says the theme for the *Pinot Gris Cookbook* and for her work at the winery's kitchen is clearly stated in the book: "The interplay of flavors between food and wine creates a harmony that is one of life's great pleasures."

She is convinced that "Pinot Gris has a bright future in food pairings."

Kimmel was project coordinator and editor for the cookbook published in 1995. She drew on 21 years of experience as chef/owner of Excelsior Café in Eugene as she reviewed and tested recipes from more than 20 U.S. restaurant chefs. Kimmel created seven dishes for the cookbook.

Before Pinot Gris became known, Kimmel says varietals such as Riesling, Gewurztraminer, and sometimes Chardonnay were recommended as the best matches for the standout flavors featured in the cookbook recipes. She suggests that Pinot Gris is more accessible than Riesling or Gewurztraminer, embodying all their best characters without any aggressive, too intense, or one-note qualities. Kimmel believes that people who enjoy drinking Chardonnay and who pair it with nearly every food will find a good transition to other white varietals through Pinot Gris.

Riesling, she says, has a dynamic fruit profile, but is perceived as sweet.

When produced dry, it is often too acidic. She suggests that Pinot Gris has a broader appeal than Gewurztraminer, which may come across as too spicy and is a "hard restaurant sell as a dry wine."

Kimmel points out that while Chardonnay has an oak component, it also has richness and viscosity and is dry — like Pinot Gris. "But Pinot Gris is richer with greater viscosity," she maintains. "Wine viscosity is very important because it carries food flavors forward."

Bone-dry Sauvignon Blanc washes away flavors and acts as a palate cleanser, illustrates Kimmel. Pinot Gris, because of its viscosity, lingers and lengthens the impression of both the wine and food on the palate.

"I look at fruitiness as an element that adds depth and body to Pinot Gris and enables it to stand up to spice components in a dish," she adds. "But Pinot Gris doesn't have oak influences fighting it. It's clean, fruity, full, and rich."

Making the match

Kimmel points out that inherent in Pinot Gris are some apple, pear, citrus, and tropical fruit aromas and flavors with hazelnut overtones. She says that many of the chefs, whose food preferences are tropical or Caribbean, picked up on that by suggesting fruit salsas, especially with papayas. "In Oregon, pears and hazelnuts are also promoted," she notes.

She singles out fennel and saffron as excellent spices to pair with Pinot Gris. "Although, not much anise character is detected in the wine, the marriage with the sweet anise flavor of fennel works very well, too. Saffron and fennel are strong flavors, but the richness of the wine stands up to them. I think it's the

earthy, pungent, slight bitterness in saffron that is mellowed by the rich fruit character of Pinot Gris."

She stresses that this is also true for hot peppers (even for the hottest — habanero), which appear in several of the cookbook recipes. To illustrate, she cites Piñon-Crusted Pacific Salmon on Fresh Morels and Grilled Fennel with Guajillo Orange-Grapefruit Sauce, created by Mark Miller of Red Sage in Washington D.C., which uses three whole guajillo chiles in the sauce. "This recipe is simultaneously piquant, hot, and spicy," Kimmel says. "The wine carries these flavors in a well-married whole across the palate."

For harmonizing herbs, Kimmel likes basil, dill, thyme, and tarragon, which she believes have an anise-like character. She also says that the wine stands up to the "intense flavors" of curry and thyme. Curry is showcased in her creation of Pork Tenderloin Roasted with Curry Spices, Peach and Ginger Chutney. "This recipe also shows the importance of playing on fruit sweetness in a wine."

Sweet successes

Pinot Gris matches anything with a little sweetness, Kimmel observes. In this category, she puts corn (particularly corn chowder), peas, carrots, sweet potatoes, garlic, and sweet onions, such as Walla Walla, Vidalia, Maui, or even grocery-store variety white onions. She includes scallops and crab in the sweeter seafood category.

"The layer of fruit sweetness in Pinot Gris makes the match with these foods," she maintains and illustrates with Creamy Scallop, Corn, and Garlic Soup, created by Jaime D'Oliveira, executive chef for The Capital Grill organization and its restaurants in Providence, Boston, and Washington D.C.

She also discusses her own creation, Pizzetta with Walla Walla Sweet Onions, Saffron, New Potatoes, Anchovies, Olives, and Thyme, in this context. "The anchovies and Kalamata olives may be a surprising match, but they serve to illustrate the versatility of Pinot Gris with Mediterranean-influenced foods."

Kimmel does not extend this Mediterranean concept to tomato-based pairings, however. "Tomatoes are difficult. They're OK, but only as a

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subtle background element in the dish."

Staying on the "sweet" theme, but focused on tomato as a problematic ingredient, she cites her own Salmon-Corn Cakes with Lemon Aioli and Tomato, Corn and Basil Salsa. "The emphasis here is the salmon, a wonderful match with Pinot Gris. Corn kernels bring in the sweet element both with the salmon preparation and the salsa. Lemon aioli adds texture and balances sweetness, while the basil, cut in a fine chiffonade for the salsa, highlights the uniqueness of this herb with Pinot Gris."

More difficult elements

Kimmel also cautions against going overboard with vinegar in matching Pinot Gris and salad vinaigrette. She suggests lemon or orange juice as vinegar substitutes and tipping the balance of the blend toward the oil.

Two recipes in the cookbook use artichokes, often considered a wine-unfriendly vegetable. Christopher Israel of Zefiro in Portland, OR demon-

strates that both artichokes and red meat can be made Pinot Gris-friendly in Lamb Stew with Artichokes, Olives, Tomatoes, and Pinot Gris, Garnished with Gremolata. Tung An Pheasant with Artichoke Hearts and Wild Mushrooms, an original recipe from Susanna Foo of Susanna Foo Chinese Cuisine in Philadelphia, PA, also proves it.

"I'm not an advocate of red meat with Pinot Gris, but I will agree that it works in Israel's recipe," Kimmel comments. "It is also true that Pinot Gris has a different taste profile if compared before and after eating the artichokes. They're both pleasant, but different."

Is there anything besides red meat, then, that Kimmel doesn't recommend with Pinot Gris? "Yes, cheddar cheese."

Editors note: All recipes discussed can be found in the *Pinot Gris Cookbook*, published by King Estate Winery, Eugene, OR, \$16.95. For mail order: (800) 433-5173.

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WINEMAKING

by Michael Westrick, assistant winemaker
J. Stonestreet Vineyard & Winery
Healdsburg, CA

Oxygen plays a vital role in wine production. Oxygen must be present to build up a culture of yeast in sufficient numbers and suitable membrane composition to maintain viability throughout a fermentation.

In red wine production, aerative rackings that saturate wine with oxygen can help adjust the tannin structure of a wine and improve overall maturation. Many wines seem to benefit from the slow oxidation that occurs as air crosses the barrel staves and interacts with the maturing wine.

There comes a time in the life of every wine, however, when further exposure to oxygen can have a detrimental effect. Knowing when to expose a wine to oxygen and how much oxygen pick up is acceptable is critical for a winemaker. Controlling oxygen exposure in white wine production is particularly critical as excess exposure has a very detrimental effect on wine quality.

Various approaches to the management of oxygen in white wine production are used by different winemakers. Oxygen must be managed from harvest right through to bottling. At some points in the process, strict control is a stylistic decision, at other times any and all exposure must be prevented to produce fine white wines. Winemakers have approached oxygen management in various ways.

At Stonestreet Winery (Healdsburg, CA), we have developed a system of management that we believe successfully leads to the production of white wines that are less likely to show signs of premature oxidation or ageing in the bottle.

Managing oxygen

Stonestreet begins oxygen management at harvest with juice collection. Grapes are pressed, either as whole clusters or as destemmed crushed berries. No sulfur dioxide is added to the grapes or juice at this point. As juice is released by the press, it is collected in a sump and then pumped to a stainless steel tank for overnight settling.

Managing OXYGEN in white wine production ²

During these steps, ample opportunity exists for the juice to become thoroughly saturated with oxygen; we make no attempt to avoid it. A substantial amount of oxidation occurs, particularly of phenolic compounds, but much of this settles out of the juice with the solids as precipitated polyphenols. The settling significantly reduces the phenolic content and levels of other oxidizable substrates left in the juice, affording an added level of protection against further oxidation.

After settling the solids out of the juice for about 24 hours, the cleared juice is racked to a second tank. We filter juice lees with the aid of diatomaceous earth, and the clarified juice is added back to the main lot.

Sulfur dioxide (30ppm) is added to the juice, primarily to inhibit the growth of bacteria that might interfere with the yeast fermentation or stimulate an undesired malolactic fermentation. Though the sulfur dioxide may also inhibit further oxidation of the juice, this addition is primarily to inhibit bacterial metabolism.

At this point, we add bentonite (two lbs. per 1,000 gallons), any nutrients, and perhaps yeast to the juice. Then the juice is pumped to barrels for fermentation, and fermentation locks are installed. Initiation of the yeast fermentation is really the point at which we strive to control or minimize any further contact with oxygen.

As the fermentation subsides, we add malolactic starter culture as needed and the barrels are topped. Until the yeast

fermentation and the malolactic fermentation are both complete, the barrels are only loosely bunged. This allows carbon dioxide gas to escape but protects the wine from contact with air. At completion of both the yeast and malolactic fermentations, the free SO₂ is adjusted to 20 ppm.

In the barrel

Over the next approximate six months in barrel, exposure to oxygen is restricted to what occurs as a result of air transfer across the barrel wood or via pickup during stirring of the lees and topping of the barrels. Stirring the lees need not be a vigorous process. A relatively gentle, smooth, short stirring will loosen and lift the lees, suspending them throughout the wine, without overly aerating the wine.

Yeast in the wine helps protect the wine from oxidation by acting as an excellent, rapid biological scavenger of oxygen. At each stirring, we adjust the SO₂ as necessary to maintain a free SO₂ level of 20 ppm. After stirring, the barrels are quickly topped and bunged.

As bottling time approaches, the viable yeast population has declined significantly, and the wine falls clear more quickly, thus making the wine more susceptible to oxidation. To prepare for bottling, the wine must be moved from barrels to a blending tank in a manner that minimizes or, ideally, eliminates the potential for contact with air.

This can be done effectively by racking the wine off the lees by pushing with nitrogen. We insert a Bulldog's

WINEMAKING

Pup™, with foot valve attachment, through the bung hole, and make a tight seal. Nitrogen gas (at about 15 psi) flows into the barrel through the Pup, pressurizing the head space and forcing the wine out of the barrel through the inner portion of the Pup.

Generally this gas pressure alone can't compete with the head pressure that develops in the blending tank, so the wine goes first to a small argon-sparged surge tank and is quickly pumped from there to the argon-sparged blending tank. The Pup pump, and all hoses are sparged with nitrogen just prior to use to reduce the amount of oxygen the wine might contact.

The traditional method of pumping wine directly out of barrels to a blending tank exposes the surface of the wine to oxygen. No matter how carefully racking is performed, small amounts of air inevitably bubble through the hoses into the blending tank, unnecessarily aerating the wine. You can monitor the efficacy of whatever method is used

with an oxygen meter. Any significant oxygen pickup indicates a need to re-evaluate the method and to locate and fix any oxygen "leaks" in the system.

To rack the wine lees, now blanketed heavily with nitrogen, we use a nitrogen-sparged topping pump to move and collect the lees into appropriately-sized, argon-sparged cooperage for settling. We use wine recovered from the settled lees as topping wine.

In the tank

Both the small, intermediate surge tank and the blending tank are gassed with argon prior to use. Tanks are typically gassed with argon rather than nitrogen because argon is significantly heavier than both nitrogen and air. It settles well into the bottom of tanks or onto the surface of wine, allowing for a reduction in oxygen levels from normal atmospheric concentrations of about 21% to less than 2%.

While studying how to gas tanks to achieve the lowest oxygen levels most

efficiently and effectively, we found that administering argon slowly via a gassing bell lowered to the bottom of the tank worked best. This approach disturbs the tank atmosphere as little as possible while replacing it with argon.

Other methods tried seem to stir the atmosphere, diluting rather than replacing the air. As a result, more gas was required to achieve the same final reduction in oxygen concentration. As the argon is "layered" onto the surface, you can measure the depth of the argon protection with the oxygen meter.

No matter what method you use, significant volumes of argon will be required to prepare empty tanks to receive wine. Theoretically, it requires about 160 cubic feet of argon to provide a two-foot blanket of protection in a tank (ten feet in diameter). In actual practice this seems to hold true. Of course, using more gas will generate a deeper bed of protection, should that be desired. However, only with a working, accurately calibrated oxygen meter can

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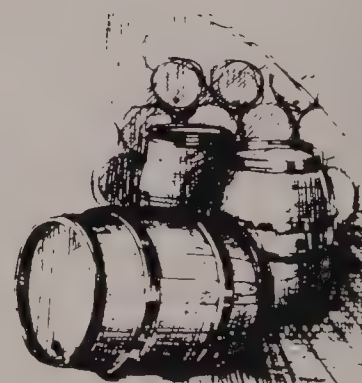
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you determine if the tank is truly satisfactorily prepared.

Though argon does a very good job of protecting wine from air, the blending or holding tank should be of appropriate size to minimize head space once all wine has been transferred. As the tank is filled, the layer of argon can become disturbed or lost. Any head space left, therefore, should be gassed again as necessary. Remember to apply argon slowly to the surface of the wine, reducing the total oxygen content to as low a percentage as possible.

The tank is then sealed. If you have venting devices in place to relieve pressures as the wine expands or contracts, don't let them allow air into the tank. A Guth vent attached to the top manway cover, with a layer of thick food-grade plastic sheeting between the tank and the tank top, is an inexpensive and effective method to block out air. Once the top is locked in place, the plastic works as a flexible diaphragm, allowing the pressure to equalize while

reducing the amount of air that enters the tank.

If you anticipate a significant amount of head space — as a result of cooling a tank to cold stabilize a wine, for example — check the head space gas with an oxygen meter and apply argon as necessary when the volume has stabilized. A satisfactorily protected tank should only need attention about once a week. Again, you'll need an oxygen meter to determine the "quality" of the head space at any given time under any given condition.

Bottling

Measure the concentration of dissolved oxygen in the wine before you start bottling. It should be on the order of 0.5 mg/L or even less as a result of careful handling of the wine up to this point. Should a further reduction in oxygen concentration or an increase in carbon dioxide concentration be needed, blanket or sparge the wine with nitrogen and/or carbon dioxide until

the desired levels of dissolved oxygen and carbon dioxide are achieved.

In final preparation for bottling, eliminate air in all hoses, pumps and filters, and the filler bowl with nitrogen after sanitizing and bubble testing any filters. Direct nitrogen into the holding tank under constant low pressure to fill the head space created as the wine is bottled. A low positive pressure on the tank will prevent air from entering. Use nitrogen also to blanket the surface of the wine in the filler bowl.

Treat empty bottles to remove any dust and debris, and replace their atmosphere with nitrogen. The latter is particularly important when using a filler that fills by gravity and whose spouts direct wine down the inside surface of the bottle. Any oxygen remaining in the bottle will combine with the wine during this vigorous mixing.

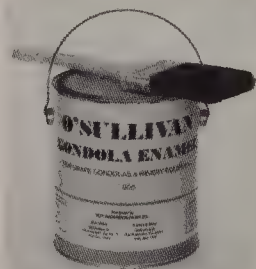
Whatever method you use to "clean" bottles, measure the amount of residual oxygen in the bottles after cleaning. Only by actually measuring the oxygen

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concentration in the bottle atmosphere can the efficacy of the cleaning be evaluated. A 95% or greater reduction in oxygen concentration within the bottle can be achieved with proper equipment and if enough gas is used.

Should bottling speed increase, thus decreasing the time each bottle is in the cleaner, the gas flow must increase also to insure adequate atmospheric exchange. We use nitrogen for this because, while the bottle is inverted in the cleaner, nitrogen is much less likely to "fall" out. It is also wise to filter gas used to sparge bottles to remove microorganisms. Sterile in-line 0.45 μ gas filters are commercially available at a small cost.

In an attempt to reduce the amount of oxygen trapped in the head space of a corked bottle, Stonestreet Winery employs a vacuum corker. As bottles leave the corker, the vacuum in several consecutive bottles is checked routinely with a pressure gauge inserted through the corks. Pressure in the head space of slightly negative to no more than +3 psi are acceptable. This by no means assures no oxygen is trapped in the head space, but it does minimize the potential for further oxidation.

Production bottling begins only after satisfactory dissolved oxygen levels are achieved in the wine. Initially, the wine will pick up the little bit of oxygen still remaining in the system, but quite

quickly the dissolved oxygen in the bottled wine should match or only slightly exceed that of the wine in the holding tank. A significant increase (generally anything over 0.2 mg/L dissolved oxygen) indicates a failure in the system at some point and warrants immediate investigation.

Which gas? When?

The choice of which gas to use at each stage depends on the purpose the gas is to serve, as well as cost. Argon costs about four times more than nitrogen. Though more expensive per cubic foot, argon is preferred over nitrogen for gassing tanks because of its weight. To adequately prepare a tank with nitrogen requires replacing all the atmosphere as nitrogen will not settle to the bottom. Total cost of preparing a tank with nitrogen is thus far greater than with the use of argon.

When the total atmosphere is replaced, such as in gassing hoses or pushing wine out of barrels, nitrogen becomes the gas of choice. Certainly, argon will work just as well, but in these situations, the cost advantage of using nitrogen outweighs that of argon by about 400%.

When large volumes of nitrogen are to be used, it is cost-effective to purchase liquid nitrogen. It is important, though, that liquid nitrogen be warmed to room temperature when used. There

are heat exchangers designed for this purpose. Using cooler gas reduces its effective volume and might, therefore, result in a less-than-thorough atmospheric exchange, assuming all other parameters remain unchanged.

Tools

A working, accurately calibrated oxygen meter is essential to monitor the effectiveness of any method of oxygen-management. Several oxygen meters and probes are available to monitor oxygen in gaseous atmospheres and to monitor oxygen dissolved in liquids.

There are probes specifically designed for monitoring atmospheric and dissolved oxygen within bottles which are relatively easy to use. Though the initial cost may be somewhat restrictive, their value in developing and maintaining a program to manage oxygen cannot be overestimated.

Conclusion

Is all this worthwhile? Are we really protecting our wines from premature oxidation? Based on the results of comparative tastings, we believe so. For any given vintage, our wines tend to be the least, or among the least, oxidized of those tasted. Additionally, we find lasting fruit flavors, which we attribute, to a large degree, to our oxygen management program. ■

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by Otto J. Ruesch, Ruesch International

Fine winemaking relies on the interaction of many variables — such as sugar levels, soil composition, and climate — all of which determine the quality of the final product. Similarly, foreign currency markets are affected by variables — such as economic figures, political situations, and social upheaval — which influence the value of the U.S. dollar.

Just as the variables left unattended in winemaking may ultimately endanger the quality of your wine, variables left unmanaged relating to foreign currency markets can jeopardize your bottom line. Despite the inherent risks and volatility of the foreign currency market, there are foreign exchange tools that allow the winery owner to minimize the effects of market fluctuations while increasing profit margins.

Whether your winery is importing supplies or exporting wine, you can improve your bottom line with a few simple actions, such as making and accepting payment in foreign currency, timely use of forward contracts, and close monitoring of the foreign exchange market. Not only will these tools empower you to control costs, but they may also build goodwill with suppliers and clients, leading to increased business.

Buying with foreign funds

In the past, U.S. companies conducted business abroad in U.S. dollars. The advantage was clear; this approach placed the full burden of the foreign exchange risk on the shoulders of the foreign customer. Today, more and more overseas partners and domestic brokers are less willing to accept the added cost of converting funds.

If your winery imports supplies, such as barrels or corks, making payment in a foreign currency allows you to lock in a rate of exchange. This way you immediately know the exact U.S. dollar amount of the foreign currency required, and the risk of sending too much, too little, or of being rebilled is eliminated. In addition to saving money, you build a better relationship with suppliers, as they receive immediate payment without paying an expensive conversion fee.

Frequently, suppliers send an invoice

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The optimal solution is to ask your supplier to quote a price in both foreign currency and the U.S. dollar amount. You can compare the two and pay the lowest price.

with the U.S. dollar equivalent calculated for the customer. Customers who remit this amount can be sure that the supplier has built in an added amount to guard against dramatic rate fluctuations and high conversion fees in order to ensure a profit margin.

By paying this U.S. dollar amount, a buyer is most likely spending more than the equivalent cost in the foreign currency. The optimal solution is to ask your supplier to quote a price in both foreign currency and the U.S. dollar amount. You can compare the two and pay the lowest price.

Selling with foreign funds

To compete in today's international marketplace, savvy exporters price goods and receive payment in foreign currency. For those exporting wine directly abroad, accepting foreign

funds facilitates payment procedures for clients and may boost the winery's competitive edge in overseas markets. Consider also that, when the U.S. dollar is weak, exporters accepting U.S. dollars may be missing an opportunity to earn higher profits in the buyer's currency. The key is to remember that the impact of the foreign exchange risk you assume can be managed effectively.

You can take delivery of foreign funds in two ways. One method is to accept a check in your client's currency, drawn on his/her local bank. By accepting a check in a foreign currency, you can choose when to convert the funds, thereby maintaining control of the rate of exchange.

Some foreign exchange suppliers offer a foreign deposit service. Through this service, your clients abroad can make payment in their own currencies, directly into a foreign exchange supplier's account abroad. Once again, you decide when to convert the funds to U.S. dollars, taking payment in an electronic funds transfer or in a check.

Locking in profits

Once your winery has committed to conducting a transaction in a foreign currency, you are exposed to market fluctuations. There are simple ways to manage the risk without undue stress.

One of the most basic means of protecting against currency exposure for a pending financial transaction is buying or selling funds "forward," using a forward contract. With a forward contract, you lock in a current rate of

exchange on the payment for goods you have contracted to buy in the future. This way you know what the funds will cost when you convert the currency at a future date. Once the exchange rate is established this way, the U.S. dollar amount is set, regardless of subsequent market movements.

As an example, let's say that a winery places an order in the spring to purchase oak barrels directly from France at a cost of 75,000 French francs. As is often the case, payment will not be due to the supplier until the barrels arrive at the U.S. port of entry. Because the price of 75,000 French francs will fluctuate over the next several months, you do not know if, when the invoice is due, 75,000 French francs will equal \$15,120 or \$15,790 or \$14,425.

By using a forward contract, you can effectively budget for this payment. You lock in a rate of exchange and establish a U.S. dollar value that will not fluctuate, for the length of the contract — commonly between one month to a year — regardless of what happens in the market.

A secured rate of exchange enables you to proceed with budgeting plans, allowing you to price wine lists without the worry of market fluctuations eroding profits. Generally, the only requirement to enter into a forward

contract is a deposit of between 10% to 15% of the dollar cost of the funds.

In the event that your payment must be delayed, some foreign exchange suppliers offer forward contracts with a flexible delivery period. Through this service option, your funds can be held up to 30 days beyond the pre-established date of delivery without affecting the secured rate of exchange.

Market basics

Staying apprised of the foreign exchange market and rate fluctuations is one of the basic tenets of managing ever-changing rates. Underlying factors, such as U.S. economic conditions, U.S. politics, and foreign conditions, drive the foreign currency market, contributing to long and short-term market movements. By understanding the market, wineries can use this information to hedge intelligently.

While it is not likely that you have the time to constantly monitor the foreign exchange markets, it is still feasible to stay abreast of market activity. Certain foreign exchange suppliers offer market monitoring services, informing you of rate movements relevant to your business on a daily, weekly, or monthly basis. You can request this service whenever you have an upcoming payment or ask to be

informed when the dollar reaches a predetermined level.

This is not to suggest that the information should be used to "play the market." It cannot be stressed enough that the simplest tools of foreign exchange can be the most effective. The key is not to outsmart the markets but to use your resources wisely and conservatively. By keeping abreast of market movements, you can better time your transactions to coincide with advantageous market conditions and maximize the value of your dollars.

Seeking an expert

Wineries are not expected to be experts on the foreign currency market, but it's important that your foreign exchange supplier is. Foreign exchange is a service offered by banks and by foreign exchange specialists. Not all such suppliers are created equal. As with any commodity, market expertise, timely updates, responsiveness, attention to detail, rates of exchange, and service fees all vary from one supplier to the next.

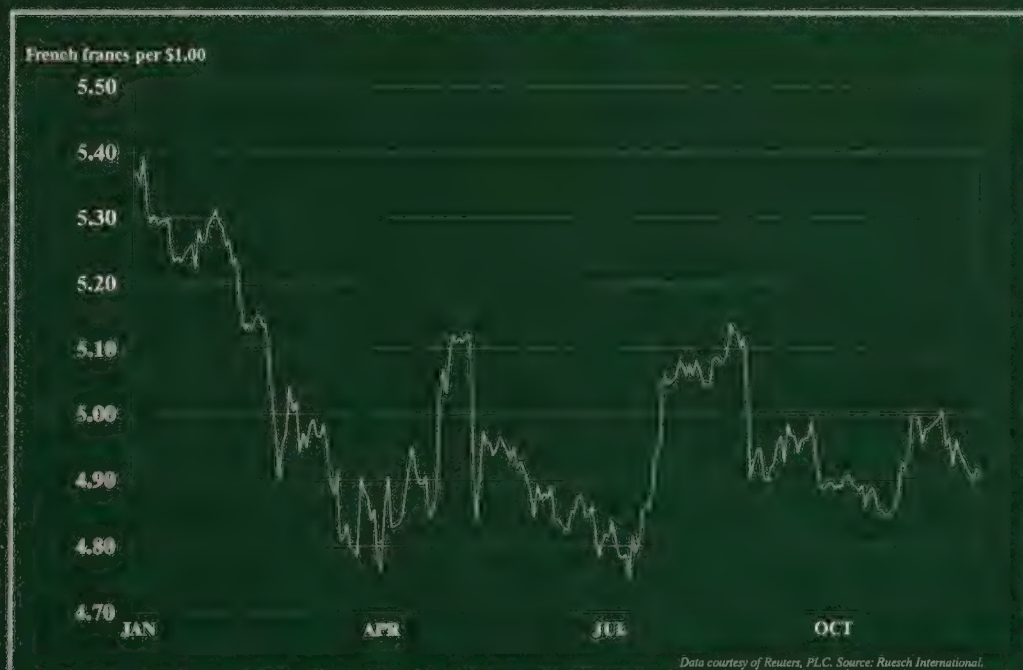
It is important to compare service fees as well as exchange rates when choosing a foreign exchange supplier. Savings realized by a favorable rate of exchange can quickly be eaten up by high service charges.

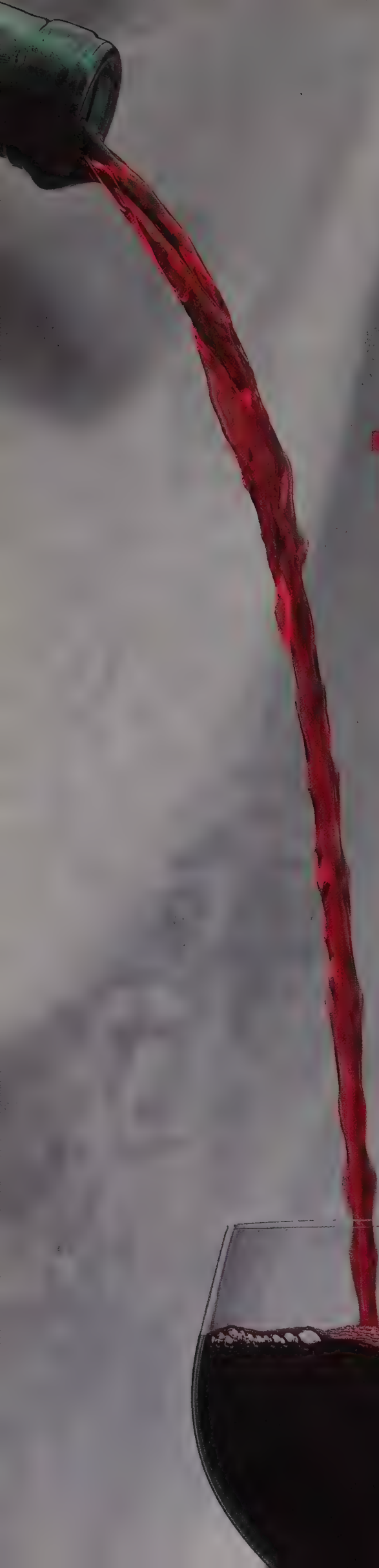
Other factors to consider when choosing a supplier include the breadth of currencies that the supplier works with, the ordering procedures, and the delivery time. Present banking relations are not affected by the decision to use a foreign exchange specialist, and you can always compare and use more than one supplier for your transactions.

Whatever your foreign exchange exposure may be, now is the time to update international financial procedures. Seek advice of competent foreign exchange suppliers, take advantage of their expertise and work with them to tailor a program to meet your specific needs. ■

Otto J. Ruesch is president of Ruesch International, Inc. Headquartered in Washington, DC, Ruesch International is a leading international financial institution specializing in worldwide payments. The corporation serves more than 15,000 clients worldwide through its offices in Washington, DC, London, Zurich, New York, Los Angeles, Chicago, Atlanta, and Boston.

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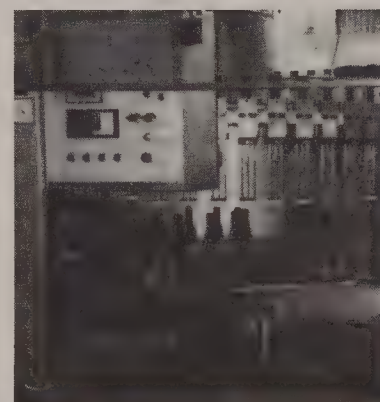
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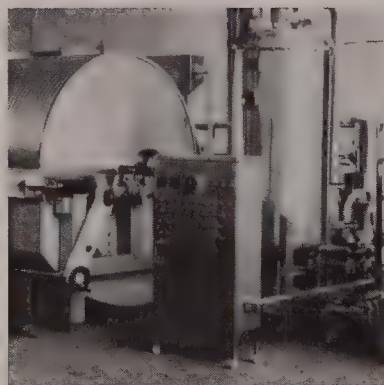
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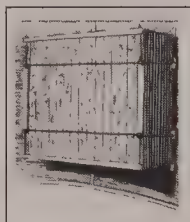
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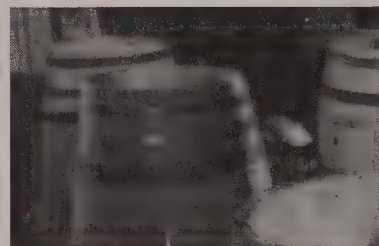
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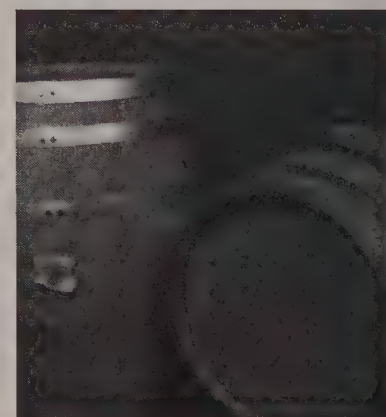
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IMPROVING YOUR TASTING ROOM

Part II

Treatment of general public visitors

by Craig Root

In the first article of this series (March/April '96-PWV) on improving your tasting room, we focused on how to staff your tasting room, the most critical element in any visitor's experience of your facility. People can go into a visitor center as impressive as the Taj Mahal and, receive indifferent service and all your effort and money spent to produce fine wines goes down the drain. They can go into a less than lustrous facility, receive first-rate friendly treatment, and leave with a lasting and positive memory of your wines and winery. As we discussed, when hiring staff, remember that you can teach "wine," but you can't teach "friendly."

We've now set the stage for a positive experience for the visitor. Let's explore some key elements of making it a great experience for them.

1. Lasting positive impression.

The first objective is to leave the general public with a lasting positive impression which will influence their purchasing choices when they return home. In their hometown store, they may see 20 different Chardonnays and remember that, at your winery, not only did the Chardonnay taste great, but the staff was friendlier and more informative than those at your competitor's winery. This is a powerful and persuasive force to induce them to select your brand.

The lasting impression should be your first objective because frequently people don't buy wine at the tasting room. They're on a bicycle tour and can't carry

it; they have already spent their trip budget elsewhere; or they simply don't want to schlepp it back home on the plane.

The point is that you don't want to waste the opportunity to increase the overall profits of your winery. Yes, they didn't make a purchase at the winery, but that doesn't mean your time was wasted if you keep this first objective in mind.

2. Profit

The second objective is to profit financially from these visitors. I like to see the average amount spent per visitor as high as possible. It may vary based on your average bottle cost, but it's a significant number to track.

Imagine a truly upbeat visit to your winery. Is the "vibe" right? I have seen so many situations where the staff and managers dread the busy season and, to some degree, resent the visitors. This is like putting on a play and being irked at the audience for showing up. If you don't want to be an actor, don't get on stage. If you don't want to relate to the public, seek employment in a business that doesn't require a lot of public interaction.

I know how stressful the busy season can be. When I started as a tour guide at Beaulieu Vineyard in the mid-1970s, we hosted more than 150,000 visitors per year.

It was so overwhelming that we not only had to lock the front doors and post a doorman to keep the visitor center from overcrowding, we actually had to block off the parking lot as well. That's one of the reasons that, even though I spend most of my time consulting with winery tasting rooms, I try to spend at least four to six days a month, preferably

on weekend days, working on the front lines, pouring wine and directly relating with the public.

As a consultant, it's critical for me never to lose track of how tiring it can be. As manager, it's also critical for you. This practice also allows me to assess various types of operations. It is also why I devoted so much attention in the first article of this series to hiring strategies and techniques for keeping your visitor center staff upbeat and friendly.

I do lots of mystery auditing of visitor centers, and I can usually tell within a few minutes what the "vibe" is. Everyone from the top management to the tasting room manager to the staff has to be aware of how important it is to be "on" — putting out energy in a cheerful, friendly manner.

3. Physical appearance of facility

Are your grounds well-kept and attractive? For example, flowers are always a great way to dress up your landscaping. Yes, they can be expensive and take much time to maintain, but visitors really respond to their presence, and they create a great first impression.

Is the tasting counter uncluttered and inviting? Are the restrooms neat all day — not just when you open? I used to work in restaurants, and one of the ways of judging a new place is to evaluate how the restrooms look when it's busy. If the restroom is very sloppy, I question if the kitchen where my food is being prepared is equally unclean. Good restaurants have their buspeople attend to the restrooms on a regular basis. It is something to keep in mind.

Subconsciously, visitors will notice these features and grade you accordingly. One tip for larger places: use high school help on busy weekend and summer days. They can help with the above tasks and also perform other duties such as stocking, helping customers to their cars with their purchases, and working with shipping. In addition, they can police the grounds regularly. Flowers are great, but if they collect litter that isn't continuously removed, the effect is ruined.

Try to avoid clutter on the tasting counter. As soon as possible, remove empty glasses or brochures that people leave behind from the counter. Keep the amount of promotional material there to a minimum. Visitors are hesitant to approach a counter that is overrun with

WINEMARKETING

empty glasses and brochures. (We will fully address the important component of display in the next issue.)

4. Visitor relations

We've now set the stage: the physical appearance is inviting and the staff is "on," how do we relate to the visitors? The first and most important task is to greet every person or group within 30 seconds. A simple "Hi, folks, welcome!" or "How are you doing today?" is sufficient to let them know you are aware of them and to create an inviting atmosphere.

When it's busy, you may be tempted to let this practice slide. In fact, this is the most important time to acknowledge guests. I can't tell you how many times on mystery audits I've seen people who enter a crowded room leave immediately if they are not greeted by staff.

All it takes is an honest: "Hi, folks, we're very busy; I'll be with you as soon as I can." People who are addressed this way will stay, taste, and purchase. Otherwise, you've lost a sale and, even worse, created an impression that you don't care about them. Your neighboring winery will be more than happy to accommodate their patronage, listening to how they were treated poorly in your facility.

Of course, the tasting experience is crucial to your success. People buy what they taste. Change the mix of wines poured and watch your sales of those wines go up. But people also buy based on how the wines were tasted — which, once again, turns the spotlight on the staff.

Does your staff ask open-ended questions? If you ask a closed-ended question such as: "Do you like Cabernet?" you have called for a yes or no answer — which does not lead to a dialogue. Open-ended questions do, such as "What kinds of foods do you like with Cabernet?" or "Have you been to any restaurants you liked since you've been in the area?" or even the simplest "Where are you from?"

These questions break the ice and start a dialogue. Staff members must keep the ball rolling. It's their job to put the energy into the conversation not the customer's. For example, when the couple in front of you answers the question of "Where are you from?" with "New York," the appropriate reply is not "That's nice" but rather

"I hear you've had a devil of a winter back there; what's it been like?"

Dialogue makes visitors feel cared about, makes them linger longer, and most important, makes them buy more. If they don't like a particular wine, no amount of dialogue will influence them to buy it. However, if they really do like a wine, a friendly exchange with their pourer can make the difference between purchasing a bottle or a half-case and a logo polo shirt.

I've seen conversations about raising children, for example, lead to a huge sale. Remember: while talking about your wines is most important, let the conversation flow along the path with the most energy and fun for the visitor. It's a great way to increase sales.

As a side note, it's essential that the pourer understands that while most people appreciate conversation with their tasting, some folks don't want it. The pourer should be perceptive enough to tell the difference.

5. The pourer must be informative

The customer to your left wants the answer to a simple query; the couple to your right wants replies to complex questions about your winemaking techniques — the staff must be able to answer them both.

Staff must take the time to educate themselves on their own. More important, management must take the initiative to inform staff on an ongoing basis through regular wine tastings, access to printed material of significance, and keeping the staff in the loop on vital information.

For example, imagine how embarrassing it is for a staff member to have a customer come in and say "I heard your cab won a gold medal in the Orange County Wine Competition" when the staff member doesn't know about it? Your marketing department knew about it; your sales department knew about it; but your visitor center didn't. Make sure this vital part of your operation is always on top of recent events of significance to your winery.

Help your staff be informative! Once again, this is ultimately a sales and public relations issue. A pourer who is able to answer a range of questions inspires the customer to purchase more and respect and remember your facility.

Another area of importance is keeping

the staff from having a superior or snobby attitude. It's great to be informative, but if you do it in a smug way, you turn customers off.

Americans are still intimidated by wine. They can go into Baskin-Robbins and not have any trouble choosing between 31 flavors of ice cream, but when they go to the corner wine shop, they often don't trust their palette. It's up to the staff to educate the public about wines in general and your wines in particular in such a way that the visitor leaves feeling "talked with" — not "talked at."

In the course of being informative, it's also important to realize that you never know with whom you're speaking. If you give a negative review of a local restaurant or another winery, the person you're talking to or someone else within earshot may have friends at those establishments.

To put this negative behavior in clear perspective, let me relate this story: A few years ago, I was taking care of a buyer for a key East Coast retail chain. Before visiting me, he had dropped in at another tasting room unannounced because he just didn't want the whole "dog and pony show." He annually sold 500 cases of this winery's product every year and

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wanted to taste a new release.

The tour guide would not let him taste this new wine only, but insisted he taste the complete flight of which this wine was the last. In addition, the guide was generally unfriendly and ignored him most of the time while gossiping with a colleague. The buyer, who never identified himself, was understandably upset: "You know, Craig, I'm not going to be selling 500 cases of their wine this year." All the work in the vineyards and the winery plus the time and effort of their East Coast sales rep went down the drain in 20 minutes.

You would think that not being negative would be self-evident, but in just the past three months of mystery audits, I've heard two tour guides knock one of their own wines in very forceful terms and yet another guide bad rap a prominent restaurant — which is a great way to get your wine deleted from their wine list.

Treat all customers as if they were major buyers or owners of a restaurant you're discussing — or suffer some very serious consequences.

6. Staff attitude toward sales

Don't be afraid to pursue suggested sales. First off, many new tour guides are put off by the word sales. Like a lot of folks, they associate sales with manipulation: thinking a salesperson is someone who talks you into buying a substandard product you don't need.

I'm referring to "helpful" sales. The easiest way to make the point with someone is to say: "What do you do the day after you've just seen a great movie?" Chances are the reply will be: "I tell my friends about it." What do you call that? It's sales — but it's designed to enhance the lives of your friends.

This is the same attitude to take in the tasting room. For example, "I see you have five bottles there to buy; if you purchase one more, you qualify for our half-case discount which means the sixth bottle will be half-price."

Or "I noticed you really liked the Pinot Noir, but we're sold out in retail stores and almost sold out here at the winery, so you may wish to pick up a few extra bottles."

Or when you notice a visitor holding the brochure for your direct mail wine club: "That club is a lot of fun — we do some great special events for club members. If you sign up today, all your pur-

chases, wine or non-wine, will be 20% off." And offer them a tasting of that month's wine club selection.

None of these examples were hard sell. They were all made to enhance the visitor's experience at the winery and at home.

7. A full-service staff

People frequently ask: "Where's a good place to eat tonight?" Make a recommendation (particularly of restaurants which carry your wines), and then, if the customers express interest in a place, offer to make reservations for them.

This gesture impresses the visitor, and if you identify yourself when making the reservation, it impresses the restaurant, which keeps your wine on their list — or helps get your wine put onto their list.

Offer to help people carry their case of wine to the car.

Try to accommodate them if they want a place to stay by having descriptions of some of the better B & Bs. Be a full-service person for them, and they will buy more and recommend your winery to their friends.

Frequently, whole families come to wineries. Be sensitive to the needs of children and seniors. If Aunt Milly or little Billy are bored, chances are they will try to get the rest of the group to leave before they've tasted, toured, or purchased wine.

Have coloring books and white (non-staining) grape juice for the kids. Direct seniors who do not wish to taste to your historical display or antique wine equipment collection. Make sure you have a place for these two groups to sit when their legs get tired. The other people in the family will appreciate this kindness and, of course, will be apt to stay longer. Plus, parents love it when you appeal to their children; you will stay in their memories longer than those wineries that don't.

8. Wine selection

It is very important to consider the selection of wines you pour and how you pour them. First, try to have a mix of wines that will appeal to your customers. America talks dry but drinks slightly sweet. Try to have one wine that fits that category such as a 2% residual Riesling.

But make sure that you also have a Chardonnay, Cabernet, Merlot, Syrah or

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WINEMARKETING

other high-end varietals for the more knowledgeable crowd. Cater to the more informed guests by opening something special — pour a taste of something not normally tasted that was left over from a visit with a trade buyer that morning, for example. Use glasses which are elegant but sturdy and serviceable. Avoid using tasting glasses which are too big or the one-ounce taste will look stingy.

Have enough staff so that every visitor has as much personal attention as possible: the increased sales will pay for the extra labor. By the way, that's why overcrowding affects sales so negatively. Many managers think that more customers equals more sales, and that's true to a point; however, overcrowding makes sales drop off. Why? It's because personal attention from the staff is what leads to greater sales — not merely tasting.

It's all right to have non-wine items to taste and sell (crackers, pasta sauces, or olive oil, etc.) but avoid tasting items such as mustard or vinegar. You're not in the mustard business; food items such as these will kill the flavor of delicate wines.

It's good to be generous with the number of wines you pour, but don't overdo it. Six to eight different wines are the limit of what most people can remember. With 10 to 14 wines, they all become a blur. Of course, for the more knowledgeable buyer, it's great to pour more than six to eight types. But for the average visitor, keep the number of wines manageable.

Change your mix of wine to reflect the seasonal changes in the type of visitor who comes to your winery. The June through August crowd, for example, might prefer the fruity semi-sweet wines in your portfolio, while, in my experience, the crush crowd is a bit more knowledgeable, so you may wish to pour more upscale wines. They can both differ from the January through March visitors. One group is not better than the others; they just have different interests.

That's why it's critical that the manager spend time on the floor so that he or she can assess these changes as they happen and vary the mix of wines accordingly.

9. Responsible service

You are serving an alcoholic beverage: your staff needs to have prior training on how to deal with intoxicated, and possibly obnoxious, behavior. In many cases, your state ABC will be happy to offer

your staff a training session on this topic.

10. Tours

The most under-rated part of the visitor center is the tour operation. In essence, you have visitors saying: "I'm willing to give you 30 minutes of my precious vacation or weekend time to listen to your story, your infomercial."

Many wineries respond: "Sorry, we don't do tours"; or "We only offer tours at 11 and 3"; or "All we have is our in-depth one-hour tour." Other industries would love to have this direct interaction with the consumer, and yet we frequently turn customers down or force them into schedules which are for our convenience — not theirs — despite the fact that those who go on tours traditionally buy more products. I recommend that you use a three-tiered system for tours:

a. *Fifteen-minute mini-tour* — Simply condense the half-hour tour by bypassing crushing and fermenting and focus on grapevines and barrel aging. If you don't have vines nearby, plant one in a barrel next to the visitor center.

Steeped in the industry as we are, we're all pretty jaded, but for a lot of visitors, actually seeing a Cabernet or Chardonnay vine is really fun. Some tour guides will balk at doing the mini-tour saying "I can't condense my tour." Hogwash! I'm not asking you to leave out the second act of Hamlet. I'm asking you to focus on viticulture and barrel aging instead of the usual half-hour tour.

The great advantage of the mini-tour is that it can usually be given at the drop of a hat. People are genuinely impressed when they ask about a tour, and you say: "I can give you a tour right now."

Most of your competition is not that accommodating — so it reflects well on you. There are times during the day when there aren't enough tour guides to allow this practice. However, there are many times when it is possible. Remember, the staff member will only be off the floor for 15 minutes or less.

Also, when your tasting room is overcrowded, the mini-tour is a wonderful safety valve. Thirty to fifty percent of the people in the room will go if the tour is described in an engaging fashion. It cuts down on overcrowding for a while — leading to greater sales and a bit of a breather for the staff still in the room. Visitor centers that only have a staff of two

can successfully do the mini-tour.

b. *Half-hour tour given as often as possible* — A 30-minute tour gives a more complete view of your winery and its techniques. Also, it is about all the average visitor is ready for. Any more than that and you bore them — especially if you've stated that the tour will be only a half hour.

c. *In-depth tour by appointment only* — These tours can vary from one to three hours and include food and wine pairing as well. One note of caution: don't pad the in-depth tour with trivia to make it last longer.

For example, I was on a tour where the guide even gave us information on the horsepower of the crusher-stemmer. Believe me, I wasn't the only person who was bored; the body language of the people near me made it obvious that they were also unhappy.

Keep in mind that the idea with any of these three types of tours is to follow the old adage about any art form — it both entertains and enlightens. One excellent way to achieve this goal is to pepper your tour with analogies.

Compare these two statements: "Barrel ageing adds flavor to the wine." "Barrel ageing is something like using a cinnamon stick; you use a piece of wood to add flavor to your hot spiced cider. Well, the winemaker uses the oak barrel to do the same for the wine." Which statement is more easily grasped by the novice wine drinker?

Overall, don't forget to pay attention to your tours. They are one of the most important ways to relate to the consumer. Plus, they increase sales. There are many methods by which I doubled the sales as the manager of the Beaulieu Vineyards tasting room and increased business by 70% at Trefethen. In each case, the tour was one of the keys to these increases.

The next article in this series on how to improve your tasting room will explore three areas that deserve in-depth attention: display, and special events, and the best ways to relate to the trade visitor. ■

Craig Root is a 25-year veteran of the wine and hospitality business. He spent 15 years at Beaulieu Vineyards and has worked in all capacities at hospitality centers, primarily as manager. For the past three years, he has also served as a consultant for visitor centers through his own company, Craig Root and Associates.

Sitevi '95

American vintners and vineyardists who want to see innovations in the wine and grape industry must travel to the European trade shows, such as Sitevi and Sitevinitech in France and Intervitis/Interfructa in Germany, to find a significant level of product development.

Most recently, I visited the Sitevi show in Montpellier, France. Historically, this show attracted only the wine industry, but under its new management, Sima, it has broadened its appeal to serve the Mediterranean fruit industry as well. This does not, however, reduce its value to the U.S. wine industry. Sitevi offers medals to innovative products which are judged by independent panels for the merit of the innovation to the industry. This system recognizes manufacturers who invest in new products.

At the 1995 show, one product received an award which is especially worthy of review for the U.S. winegrape industry: a vine-tying device by Pellenc which was modeled after the Pellenc pruning shears. The Pellenc shears won the award in 1991 and are also worthy of mention here because, after a revamping, Pellenc began importing the shears to the U.S. in January.

Pruning shears by Pellenc

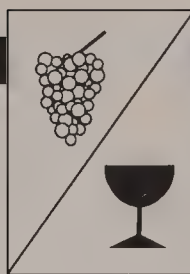
The new pruning shears are battery-powered; they increase speed and reduce injury to the vineyardist. In the 1991 version, the idea was excellent and implementation was good, but the price was very expensive (nearly \$2,000). Pellenc modified the electric pruner and now has decided that it has reached the point of development and reliability that it can be imported into the U.S.

With the new P2000 pruner, the operator can prune 30% more vines than can be pruned by hand. When using the electric cutters, the pruning accuracy is maintained at a very high level through the course of the day because the worker's hands do not get as tired. Using Pellenc's electric pruner also reduces the possibility of carpal tunnel syndrome.

The company has reworked the battery, lightened the unit, and given it a quick-charge battery system. Thus, instead of the original eight-hour battery, a worker now has one that lasts three to four hours and recharges to full capacity in one hour (during the lunch hour).

The new price will be about \$1,370 for the U.S. market. At this price point, the unit will probably receive its best initial reception at vineyards where the owner is doing most, if not all, of the pruning.

Vineyard owners want quality work and are even more interested in reducing or eliminating long-term physical injury that results from repetitive pruning tasks. The second target market will be owners who have permanent staff hired to maintain their vineyards. They will likely find this unit



by Richard Carey

valuable because it may reduce workers compensation claims for carpal tunnel syndrome, which could potentially pay for several units.

When Pellenc began importing the pruning shears in January 1996, the company established a U.S. office and conducted trials of these units at various locations throughout the U.S.

While the pruner described above was an award winning innovation in 1991, it is new to the U.S. market. The development which won a gold medal for Pellenc in 1995 was a vine-tying device modeled after the pruning shears.

Pellenc vine-tying device

Like the pruning shears, Pellenc's vine-tying unit is hand-held and attached to a battery cable and pack. In the battery pack is a 200m roll of paper-coated wire. The 0.4mm diameter wire runs parallel to the battery cable and through the hand piece to the hook end. The worker places the hook over a vine, and with a pull of the trigger, the unit wraps the tape around the vine, twists it into place, and cuts it. The entire operation takes 0.2 seconds.

The largest diameter vine/support wire that the unit can tie is 30mm. Using a dial on the handle of the actuator, the operator can set the tension of the wire twists on the vine. In this manner, the wraps can be made loose enough to accommodate green vines.

The unit allows the operator to use both hands in the tying process. One hand controls the vine and one hand places the wrap. Time studies have been conducted in Champagne, France, to compare groups using traditional hand-tying methods with mechanical aids for tying. Compared to hand tying, the device is four to five times faster and proved to have a higher quality result, especially at the end of a day's work. When compared to other mechanical methods, Pellenc's device was twice as fast.

The mechanical design has gone through two major prototype development phases. Pellenc says that the design shown at Sitevi will be the production model. It will be formally released in the U.S. market towards the end of 1996. For more information, contact the Pellenc office at 955 South Virginia St., Suite 116, Reno, NV 89502; (702) 826-4611 or fax: (702) 324-1399.

Braud

The Braud Saphir series of mechanical grape harvesters was awarded a silver medal for its ergonomic cab design at Sitevi. The ergonomically redesigned cab combines many innovations in safety and production quality.

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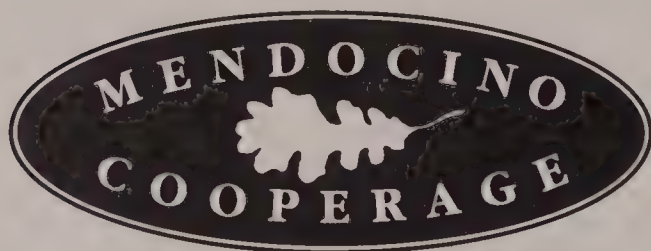
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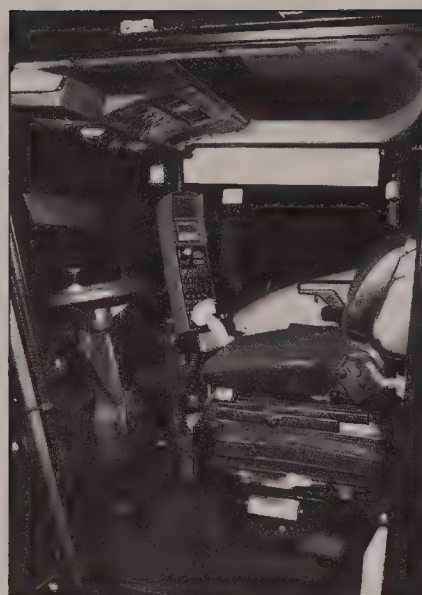


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motion, belt speed, and extractor operation. All functions have digital readout, and settings can be changed at any time by the operator.

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For further information, contact: Matt Eiser, Euro-Machines, in Virginia, tel: 540/825-5700, fax: 540/825-5789 OR in California, tel: 408/452-7600, fax: 408/452-7689.

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Introduction

Wine production filtration standards vary widely among wineries. Usually, the standards are set by the experience of the winemaker, and the resulting data is generally neither easy to obtain nor reliable.

The biggest problem with most filterability testing is that the results are often subjective rather than analytical, and do not result in filterability test values that actually relate to "real life filtrations."^{1,2,9} This was true until F. De La Garza and R. Boulton developed their models of wine filtration and offered a standardized method of filterability testing and analysis.^{4,6,7}

The test consists of filtering wine, contained in a pressure filter holder, through either a filter sheet or membrane, at a constant pressure. At recorded time intervals, dT (usually one minute), the filtrate volume, dV , is recorded. The inverse rate, dT/dV , at any time interval is equal to the instantaneous resistance, R . The resistance, R , is calculated for each interval and compared to the accumulated filtrate volume at the midpoint of the interval.

Perhaps the most common use of filterability testing is to determine if wines are ready to be filtered through a membrane prior to bottling. The important parameters determined by the test are the Correlation Coefficient, and the

"b" value (the slope of the filterability curve). The smaller the "b" value, the better the filterability.

Since the objective of a bottling membrane filtration is an "insurance" filtration to remove low levels of micro-organisms, and not to remove high solids levels, cellar filtrations tested by membrane filterability, prior to bottling, should achieve "b" values in the range found for wines membrane filtered during bottling. This can be done by immediately testing wines that have been given their final membrane filtration during bottling.

It is necessary to test wines immediately after filtration as the filterability may deteriorate with time. It is also necessary to bottle wines subject to membrane filtration and with acceptable "b" values as soon as possible after final pre-membrane filtration.¹⁰

The goal at Sebastiani Vineyards was to use a reproducible, analytical filterability test that would result in test values that could be correlated to production membrane filtrations. The filterability test would have to be cost-effective for a large number of samples and be easy to perform.

The data generate a filterability curve that can be viewed as a graph or defined mathematically as a regression

curve. The use of a computer program to record and/or analyze the data facilitates the calculations and also allows programmed regression analysis to be performed on the test data. The computer analysis also considers the temperature, pressure and viscosity for each test, and the volume collected/unit area (V/A).⁵ The data can also be analyzed manually.¹⁰

Theory

De La Garza and Boulton developed two mathematical models to describe the fouling of filter sheets and membranes.^{6,7} A third model developed earlier by D. R. Sperry describes precoat filtration.¹¹ It was Sperry who first observed that the fluid resistance term is made up of two components, one due to the filter media and the other due to the material being collected on it.

The Linear Model (Sperry) reduces to:

$$R = R_m + (\alpha c)(V/A) \quad \text{Eq. 1}$$

where:

R = Instantaneous Resistance

R_m = Medium Resistance

αc = The Slope = Specific Cake Resistance (α) X Concentration of Solids in the liquid being filtered (c)

V/A = Filtrate per Unit Area

A plot of the Instantaneous Resistance (R) vs the Filtrate per Unit Area (V/A) will be linear with an intercept of R_m at $V/A = 0$ and a slope of (αc) , if the fouling is linear. See Fig. 3 for a typical Linear Model filterability curve.

The Exponential Model (De La Garza and Boulton) reduces to:

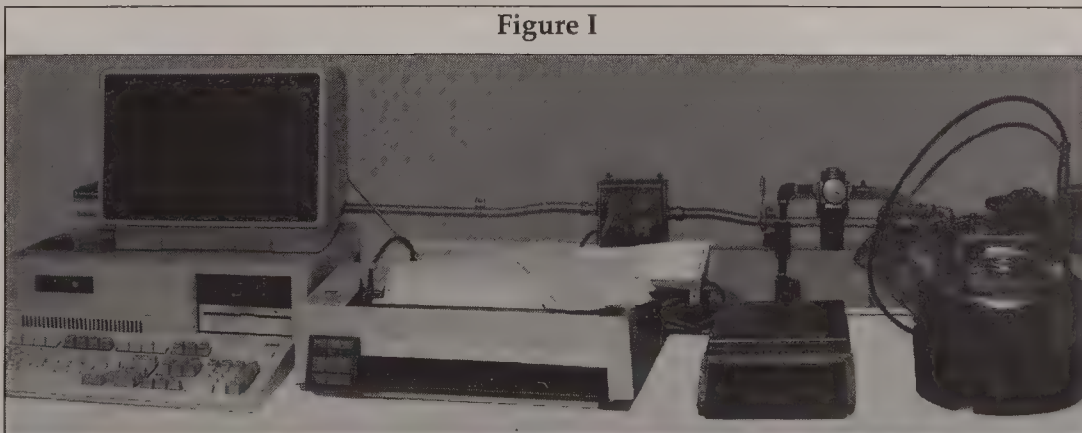
$$R = R_m (\exp)^{(b)(V/A)} \quad \text{Eq. 2}$$

or, taking the natural logarithm of both sides:

$$\ln R = \ln R_m + (b)(V/A) \quad \text{Eq. 3}$$

where:

Figure 1



WINEMAKING

R ; R_m ; and V/A = the same as the Linear Model

b = The Slope = Exponential Fouling coefficient

A semi-log plot of the resistance (R) vs the filtrate per unit area (V/A) will be linear if the Exponential Model describes the fouling. Fig. 4 illustrates a typical Exponential Model filterability curve. The Exponential Model assumes an immediate and progressive fouling of the pores of the filter due to either surface fouling or depth collection. The rate of fouling is assumed to be proportional to the instantaneous resistance (R). As filtration progresses, fouling increases exponentially.

The Power Model (De La Garza and

Boulton) reduces to:

$$R = R_m + (a)(V/A)^b \quad \text{Eq. 4}$$

or, taking the natural logarithm of both sides:

$$\ln(R - R_m) = \ln(a) + (b) \ln(V/A) \quad \text{Eq. 5}$$

where:

R ; R_m and V/A = the same as for the Linear and Exponential Models

a = Power Fouling Coefficient

b = The Slope = Power Fouling Constant

A log-log plot of $(R - R_m)$ vs (V/A) is linear if the power model describes the fouling. A typical log-log Power Filterability curve is shown in Fig. 5. Since R_m is not known initially, it can be determined by iteration until the

equation shows maximum linearity.

Initial Conditions:

The initial resistance is always equal to the filter medium itself, R_m . The fouling term (b) of the Exponential Model (Eq. 2, 3) reduces to one when no filtrate has been collected; or:

$$R = (R_m)(1) \text{ at } V = 0$$

The fouling term (b) of the Power Model (Eq. 4, 5) reduces to 0 for the same condition; or:

$$R = R_m + 0 \text{ at } V = 0$$

Practical considerations:

For day-to-day filterability comparisons, the area can be kept constant so the term, A , in the above will reduce to one. The above models can then be rewritten:

Linear Model:

$$R = R_m + (\alpha c)(V) \quad \text{Eq. 6}$$

Exponential Model:

$$R = R_m (\exp)^{(b)(V)} \quad \text{Eq. 7}$$

or:

$$\ln(R) = \ln(R_m) + (b)(V) \quad \text{Eq. 8}$$

Power Model:

$$R = R_m + (a)(V)^b \quad \text{Eq. 9}$$

or:

$$\ln(R - R_m) = \ln(a) + b \ln(V) \quad \text{Eq. 10}$$

Because it is time-consuming to iterate the Power Model without a computer program; and the fact that the difference in the correlation coefficient between the Exponential and Power Models is usually very small; it is suggested that the "practical" model of choice, when analyzing data without a computer, is the Exponential.

The Exponential Model will accurately describe most filterability tests utilizing a filter sheet or membrane as the test medium. The Linear Model may better describe most precoat filtrations, but it is difficult to do laboratory precoat filterability testing.

Using the Exponential Model, the slope of the curve, " b ", is described as the Exponential Fouling Coefficient. The " b " value can be mathematically

Figure 3

Linear Filterability Curve

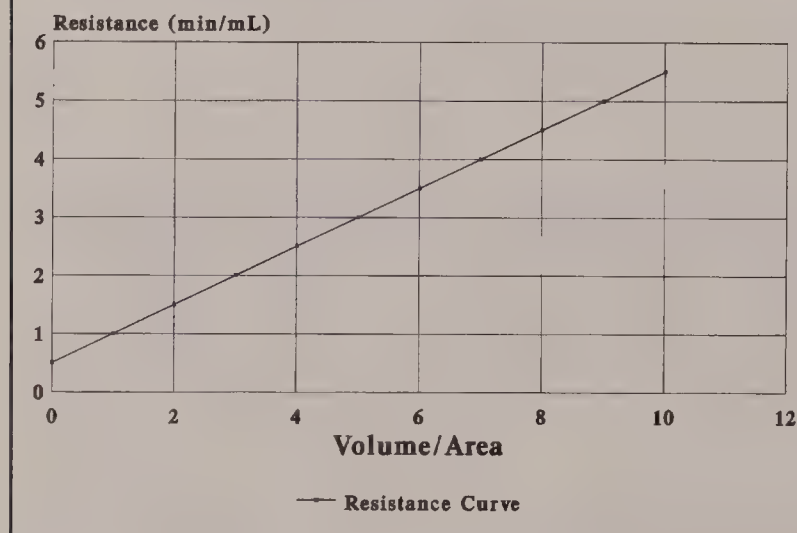


Figure 4

Exponential Filterability Curve

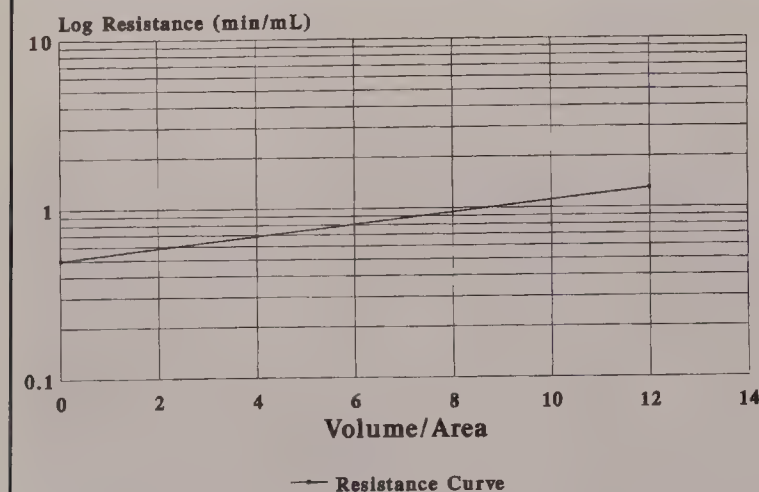
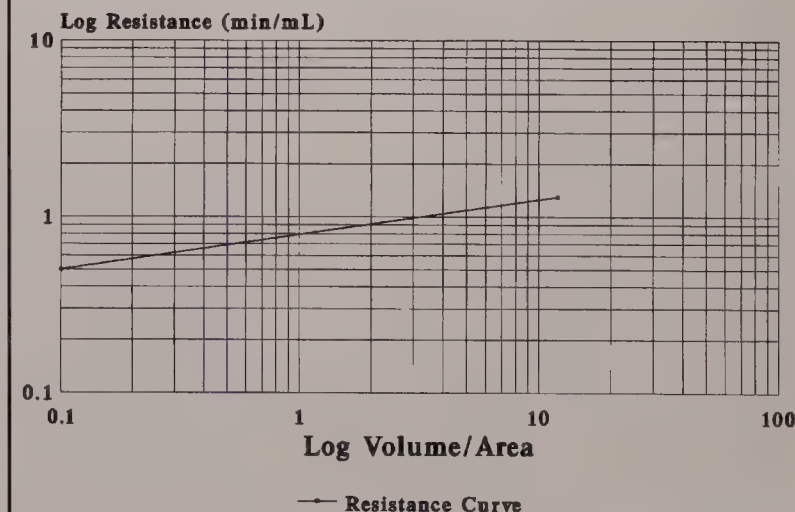


Figure 5

Power Filterability Curve



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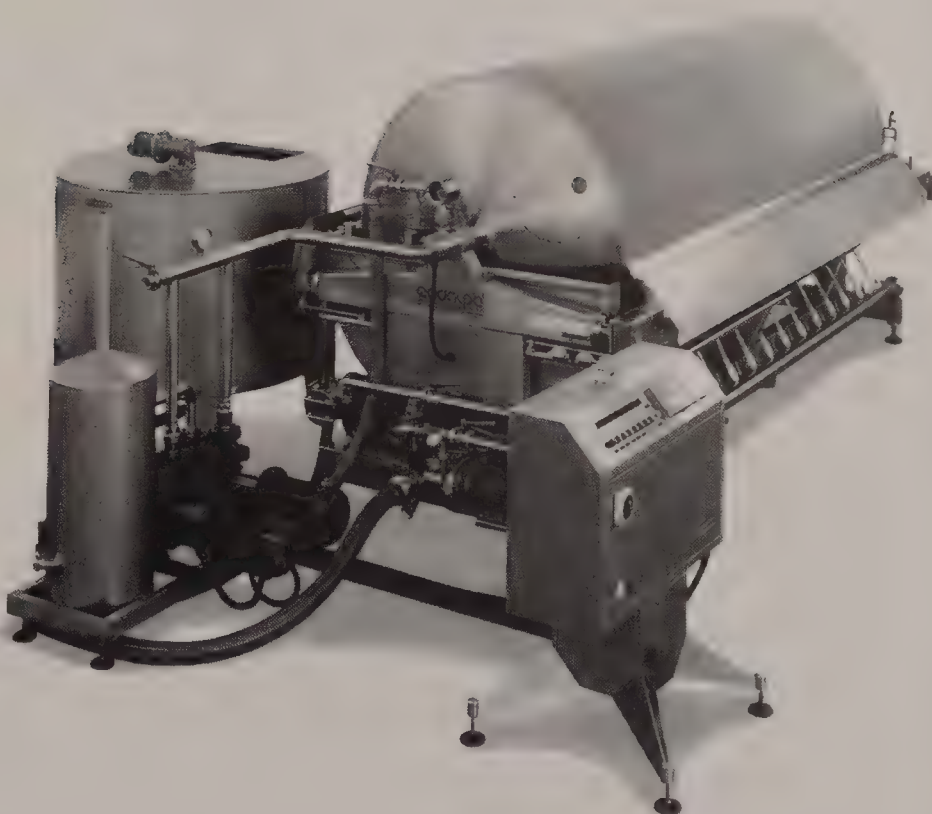


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WINEMAKING

derived from regression analysis of the filterability analysis test data.

The regression analysis can be done manually (time consuming); with a pocket computer and/or scientific calculator which is capable of doing regression analysis. Or the analysis can be done easily with a computer program. A MS-BASIC program developed by De La Garza and Boulton is available).^{6,7}

It is important to remember if the MS-BASIC computer program is *not* used to analyze the filterability test data, the filterability test area, pressure and temperature *must* be held constant for any group of comparison tests.

The MS-Basic program allows inputs for variations in the three potential variables. Even using the computer program, it is best to keep the variables constant for any given set of tests. Most laboratories will adopt one set of filterability test parameters and use these parameters for all their tests.

As an example, one laboratory uses a 0.45 μ , 13mm dia. membrane filter, 50 psig N₂ pressure, and 20°C for all its filterability tests. For reproducible results, it is very important to use a regulator on the pressurizing gas supply, then set it and forget it. Turn on the gas pressure with the main supply valve, not the pressure regulator or use an in-line valve between the pressure regulator and the filter chamber.

The Exponential Fouling Coefficient and/or the Power Fouling Constant, "b", can be used to assess the potential for a wine to foul a sheet or membrane filter used prior to bottling. The test can also be used to evaluate the efficacy of fining agents, settling times, and/or cellar filtration techniques to improve filterability, either through pre-coat, sheet or membrane filtration.^{3,8,10}

Materials and methods

- 3.8 L stainless steel pressure vessel, or other filter holder
- Pressure vessel fittings
- Nitrogen supply
- Pressure regulator (two-stage, nitrogen, 0-100 psig with pressure hose and quick-disconnect fitting)
- 13mm dia Swinnex filter holder
- 1/4" NPT female to Swinnex female (stainless steel luer adaptor)
- 13mm dia 0.45 μ membrane filters;

or other filters to be used or tested

h) 500 mL beakers and 1500 mL sampling containers

i) 50 mL graduated cylinders (two needed only for manual method)

j) IBM compatible computer with monitor, serial port, DOS and MS-BASIC or GW-BASIC (8088 through Pentium processor will work)

k) Printer

l) MS-BASIC filterability analysis programs for automated data collection and/or manual data collection (available from: L.A. Berg, PO Box 293, Rutherford, CA 94573). A nominal fee is charged to offset costs; please inquire.)

m) Top loading balance that will weigh to 0.1g with a bi-directional data interface option (1000g capacity; used only for computer data collection)

n) Stopwatch reading in minutes to at least 30 minutes in hundredths of a minute, or convert minutes and seconds to decimal minutes (used only for manual data entry)

The above will cost about \$2,800 including the balance and a used, reconditioned computer, monitor and printer. If manual entry of filtration data is expected, the cost will be about \$1,400, or less, depending on the laboratory and computer equipment available. There are other pressure filters available that can be used instead of the 3.8L pressure vessel listed, which is somewhat difficult to handle and clean.

Filterability test procedure:

A) Thoroughly clean the pressure filter apparatus with warm soapy water. Rinse with warm water, then rinse with distilled or deionized water. The water used must be as clean as the wine to be tested! If possible, use membrane filtered distilled or deionized water.

B) Rinse the pressure filter apparatus with two small portions of the wine to be tested, draining some wine through any openings and valves. Close all valves and attach to clamp stand, if used.

C) Introduce the test wine into the filter apparatus and seal. Attach the nitrogen line from the cylinder regulator to the quick disconnect fitting. Be sure the pressure relief valve is closed.

D) Open the main nitrogen gas valve. The regulator pressure valve and the regulator should be preset to 50 psig. Do not adjust from test to test.

E) Open valve to luer adaptor to fill apparatus with wine. Close valve. Open the pressure relief valve for a few seconds to displace air in the head space above the wine.

F) With forceps, carefully pick up a membrane filter and soak it for a few seconds in the wine to be tested. Place the pre-soaked membrane in a Swinnex filter holder that has been thoroughly cleaned and rinsed (see A above). Attach the holder, with membrane, to luer adaptor.

G) Start the filterability test. If manual data entry is used, continue with H below. If computer automated data entry is used, continue with M below.

H) Continuing with manual data entry: have two 50 mL graduated cylinders available, placing one under the outlet of the Swinnex filter holder. Set the stopwatch to zero.

I) Start the test by opening the outlet valve and starting the stopwatch at the same time.

J) At time intervals, usually one to two minutes, replace the filling cylinder with the empty one. Record the time from the start of the test, dT, and the volume of wine collected, dV. Empty the cylinder in preparation for the next time interval. If possible, take at least ten readings.

K) It is not necessary to record readings at exact one minute intervals if you are using the MS-Basic computer program to analyze the results. The program can account for any time interval/volume input. It greatly simplifies data reduction, if computations are performed manually or via programmable calculator/hand-held computer, if time/volume data is at exact one minute intervals. If a one minute interval results in less than 25 mL of wine collected, go to a two-minute interval.

L) After the tenth or last reading:
CLOSE the filter outlet valve;
STOP the stopwatch;
RESET the stopwatch to zero;
CLOSE the main valve of the nitrogen source;

RELEASE the pressure by opening the pressure relief valve.

M) Continuing with automated computer data entry: turn on the computer and printer, then load and run "MAX-FILT.BAS." Place a 500mL beaker on the scale to catch the filtrate and tare the scale. Start the test by simultaneously pressing the "Enter" key on the

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computer and opening the outlet valve on the filter pressure vessel.

N) The computer will automatically sample the scale, via the serial port, at one minute intervals for ten minutes and store the time, in minutes, and weight, in grams, in an array. At the end of ten samples, the program prints results of the test.

O) When the test is over:

CLOSE the filter outlet valve;

Figure 2. Typical print out from computer data collection and analysis¹

Data Points	Seconds	Grams
1	60	29.7
2	120	50.9
3	180	69.9
4	240	87.8
5	300	104.7
6	360	120.7
7	420	136.6
8	480	151.9
9	540	166.7
10	600	181.5

Linear Model

Correlation Coefficient = .979

Cake Resistance (α) = 8.637124E+09

Exponential Model

Correlation Coefficient = .970

Decay Constant (b) = .184421

Power Model

Correlation Coefficient = .993

Power Index (b) = .5019991

¹Similar data (ml) would be gathered from manual collection.

CLOSE the main valve of the nitrogen source;

RELEASE the pressure by opening the pressure relief valve.

Results and discussion

Fig. 1 shows the filterability apparatus used at Sebastiani Vineyards. Fig. 2 is a typical print out of the data collected and the resulting regression analysis of the three filtration models. Only the data from the Exponential and Power Models are used to assess the readiness of a wine to be membrane filtered prior to bottling.

A Exponential Decay Constant (b) less than 0.2 and/or a Power Index (b) less than 1.0 are considered to be safe values and wines with filterability values below these have little chance of fouling the bottling membranes. It should be noted that these values are *not* universal. Each winery should establish its own values, perhaps by testing bottled wines immediately after membrane filtering and bottling.

Usually, the Exponential Decay Constant is evaluated first. If its value approaches the 0.2 maximum, then the Power Index is also used to decide if the wine needs additional pre-filtration prior to final membrane filtration. If both maximum filterability values are exceeded, the wine is re-filtered. The Correlation Coefficients of the models also must be high, typically above 0.95. If not, the wine must be re-tested, and if it fails the second filterability test, filtered again, in the winery.

Filterability testing may be used during the entire time wines are being pad-filtered prior to bottling with membrane filtration. The tank to be filtered is sampled and tested. If the filterability values are at the maximum or below, the tank is sent to membrane filtration and bottling without additional filtration. If not, the wine is pad filtered and a sample is taken and analyzed immediately after the sheet filter is operating and at one hour intervals during the filtration.

Sheet filtration will continue as long as the filterabilities remain below the maximum values. When the "b" value exceeds the maximum, the filtration is halted and the filter sheets are changed. This process continues until the entire tank is pad filtered and acceptable for membrane filtration and bottling.

Table I illustrates the volume of wine filtered through the 0.45 μ membrane filters (volume/area) at Sebastiani Vineyards/Woodbridge for the time period June 1990 through April 1994. This table also shows the volume/area filtered during the base period of June 1990 through January 1992 when the filterability test was not used.

The percentage of wines membrane filtered that did not pass the De La Garza-Boulton filterability test and the percent of increased volume achieved vs the base for each time period is also shown.

Using the filterability test to judge results of pre-bottling filtrations has increased the volume filtered through the membrane filters significantly. Comparing the period June 1992 through June 1993 when 13.7% of the wines sent to Line #1 bottling membrane filters did not pass the filterability test (234,785 L/m² or 5,763 gal/ft² bottled) to the period of June 1993 through April 1994 when only 0.3% of the wines did not pass the test (353,593 L/m² or 8,679 gal/ft² bottled) resulted in an increase in bottling membrane filter life of 50.6%; and an increased membrane filter life over the base period of 442%.

Similar results were recorded for Line #2. The increase in membrane filter life from the period June 1992 through June 1993 compared to June 1993 to April 1994 showed a gain of 79.6%; and a gain of 454% compared to the base period of June 1990 to January 1992.

Table I Bottling line 0.45 μ membrane filtrations — June 1990 through April 1994.

DATES	VOLUME FILTERED		% NOT	% INCREASED
	L/m ²	Gal/ft ²	PASSING TEST ¹	VOLUME vs BASE ²
Line No. 1				
6/90 to 1/92	79,955	1,963	-	Base
1/92 to 6/92	246,396	6,048	?	308.2
6/92 to 6/93	234,785	5,763	13.7	293.5
6/93 to 4/94	353,593	8,679	0.3	442.2
Line No. 2				
6/90 to 1/92	61,499	1,510	-	Base
1/92 to 6/92	87,591	2,150	?	142.4
6/92 to 6/93	222,114	5,452	13.1	361.2
6/93 to 4/94	279,077	6,850	0.5	453.8

¹ De La Garza-Boulton filterability test. ² Base = Time when De La Garza-Boulton filterability not used.

Conclusions:

Using results of the De La Garza-Boulton filterability analysis of wines, sheet filtered prior to bottling, to assess their propensity to plug the membrane filters, can result in large increases in the volume filtered through the membrane filters. The money saved on cost of membrane filters would soon off-set the cost of equipment used, even if all equipment had to be purchased. ■

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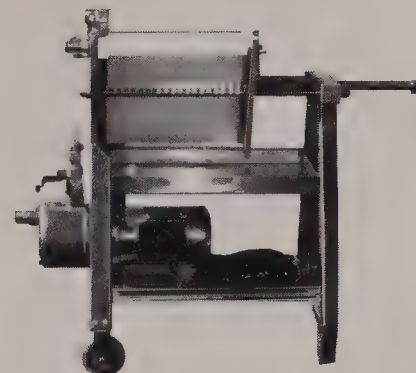
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WINEMARKETING

by Scott Clemens

Vichon is a small winery whose marketing depends on education and image enhancement, promotions, and word of mouth," according to Keith Moak, marketing manager for Vichon Winery, Oakville, CA. "We don't really have a budget to invest in consumer advertising."

When Vichon was founded in 1980, it found its niche in the market by leaning heavily on traditional French techniques that were not yet in common use in California. It was the first California winery to bottle a 50/50 blend of Sauvignon Blanc and Semillon aged on the lees (*sur lies*) and among the first to use extended maceration to soften Cabernet Sauvignon. In 1985, when Vichon was acquired by Robert Mondavi Winery, ageing *sur lies* was still considered risky.

Vichon has always been considered a quality operation, winning *Wine & Spirits* magazine's Multi-Source Winery of the Year award in 1993. But in the past decade *sur lies* ageing has become the norm, extended maceration is now commonplace, and many premium Sauvignon Blancs include 10% to 20% Semillon in the blend.

Vichon's image as an innovator eroded as those innovations became conventional. From a marketing viewpoint, now that the rest of the pack has caught up, the problem is how to differentiate the brand from its competition. How can a winery successfully promote itself on a limited budget?

Several significant changes have occurred at Vichon since 1993, including the launch of the Vichon California line of value-based Chardonnay, Cabernet Sauvignon, and Merlot, which at 140,000 cases/year is triple the winery's Napa Valley line. Chevrier Blanc, Vichon's flagship white Bordeaux blend of Sauvignon Blanc and Semillon (created by the original owners), was renamed Chevrignon. Merlot and a Stags Leap District

Cabernet Sauvignon were added to the Napa Valley line.

In 1993, when Moak joined Vichon, he and Margaret Kearns (Robert Mondavi marketing-communications manager) felt it was time to rejuvenate and solidify Vichon's image and to establish Vichon's iden-

Cross merchandising Vichon & Laura Chenel



Kearns and some other employees talked over lunch and came up with the obvious play on the words Chevrignon and Chèvre (goat cheese) — Chev and Chev. It was a catchy slogan, and the two products actually paired quite nicely.

Furthermore, as a proprietary wine, Chevrignon is the one wine in the line that sets Vichon apart from the crowd.

Kearns phoned Laura Chenel, America's first producer of French-style goat cheese in Sonoma, CA, to explore the possibility of their working together. Chenel was interested and sent her cookbook, which was passed around and then put on the shelf. A year and a half later, when Moak came on board (his previous experience was with Chateau St. Jean and William Hill), the idea was revived.

"One of the things that came out in our first meetings with Laura," says Moak, "is that it wasn't

really our intention to grow either of our products."

As Vichon is committed to a 50/50 blend of Sauvignon Blanc and Semillon with a Napa Valley appellation, production of Chevrignon is limited by availability of those grapes. "This campaign is really more about building the image of two wine country products while working with existing clients (restaurants and retailers), who have been supportive of both of our products. We wanted to do some really fun things and also shine some light on our clients and their food and their chefs," Moak explains.

Chenel's cheese is available nationwide but only in selected markets. In 12 markets, Chenel and Vichon supply

tity separate from other wines in the Robert Mondavi family.

In developing a cohesive marketing campaign, Kearns wanted to focus on food. "We really believe the best way to market wine is with food. It's a natural marketing campaign for us, and illustrates wine's integral role at the table."

"We're already going to be promoting a certain amount of our wine anyway," adds Moak, "so why not do it in an environment that's more focused and educational, rather than randomly sending out samples to winewriters and hoping they'll like it? Why not put it in a context?"

An idea for that context had been growing for about three years, since

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WINEMARKETING

many of the same restaurant accounts. From the beginning, Vichon's wines have been tailored to the restaurant trade, and in fact, restaurants account for over 50% of sales. Restaurants account for 75% of Laura Chenel's Chèvre sales.

Using Chenel's recipes and new recipes developed by Robert Mondavi chef Michael Chipchase, the marketers set a plan in motion to reintroduce Chevrignon in the 12 top markets where Vichon and Laura Chenel accounts coincided. These include San Francisco, Los Angeles, New York, Chicago, Washington D.C., Minneapolis, Detroit, Miami, Atlanta, New Orleans, Denver, and Boston.

The promotion was broad-based and designed for the press, the trade, and consumers. Special programs were tailored to each market and included press luncheons, trade luncheons, consumer dinners, and in-store cooking demonstrations and tastings at Vichon's retail clients. The consumer events paid for themselves, as each attendee paid between \$50 and \$75 for the dinner, depending on the restaurant.

Kearns coordinated the press contacts, while relying on the restaurants and distributors for their consumer mailing lists.

"Most people in the industry would agree we spend a lot of time preaching to the choir," says Moak. "One of the great things to come out of these events is that we have been able to reach many different audiences."

Part of the concept for developing the press list for New York was to draw interest from women's magazines by emphasizing the high profile women involved in the winery and cheese company: cheesemaker Laura Chenel, winemaker Karen Culler, Vichon's general manager Paula Kornel, and Marci Mondavi Borger, who is in New York. A CNN interview with Kornel aired in early March 1996.

The consumer dinners were all sell-outs, including two dinners in New York for 50 and 60 people each. "That's on the high end of how many people we like to attend," says Moak, "because above that it's not personal enough."

Establishing personal relationships in the marketplace is a philosophy that permeates the Vichon organization. "If you visit the winery you will under-

stand that it's a quality operation, but not everyone can come to the winery, so we try to bring the winery to people around the country by bringing out the people who work in the winery, particularly our winemaker, Karen Culler. Then we can taste the wines with a complex variety of foods, give each person a press kit, and talk to them individually."

As to demographics, Moak states that, "We like to think that wine shouldn't be so much of an exact demographic target. Wine should be approachable and interesting to everybody. We'd like to see it part of the culture, so we don't do sophisticated demographic marketing." The people who attended the consumer dinners were equally balanced between male and female and ranged in age from 20 to 70.

While Chevrignon was ostensibly the focus of the luncheons and dinners, the campaign served also to direct attention to other wines in Vichon's Napa Valley portfolio. At the Northern California press luncheon at the winery, for example, the menu was designed to begin with Chevrignon served with the first course, followed by the Cabernet Sauvignon with the main course, and a Botrytis Semillon with dessert. All courses included Laura Chenel's Chèvre.

In each of the 12 markets, retail accounts were supplied case cards featuring tear-off recipe cards containing four different Chèvre recipes and shelf-talker/neckers with a recipe on the back. All of the items incorporated attractive photographs of Chèvre cheese courses surrounding a bottle and glass of Chevrignon and the slogan Chev & Chev "meant for each other." Table brochures were available for restaurant accounts.

Chipchase (Mondavi chef who worked closely on this project), traveled with Vichon personnel to some events and developed many Chev and Chev recipes that were made available to food editors across the country. One batch of recipes was released on Business Wire around the holidays.

The entire promotion for all 12 markets, including shelf-talkers and case cards cost approximately \$30,000. The cost does not include labor, as the people involved already work for

Vichon/Robert Mondavi, and their salaries are considered a fixed cost of doing business. Chenel supplied her time, product at events, and recipe input. Her national sales director, Bruno Bardet, hosted several events.

For Chenel, the results are difficult to measure. With demand already outpacing supply, tracking increased sales could not be used to measure the success of the program. Image enhancement is hard to gauge, though, she says, "Vichon did a fabulous job on the printed promotional materials." Logistical challenges did arise. "We're a small company with limited production and without a national sales force to support such a promotion. Bardet felt the project was very difficult to coordinate on a sales level."

At Vichon, however, the effects of the promotion were felt almost immediately, and in a sense it was too successful.

An increase in sales occurred at each account where events were held and at nearby retail accounts. Chevrignon sold out in California, Chicago, and New York after promotions there, about two months before the next vintage was available, forcing the winery to move wine around between different accounts.

"This was the first time that Chevrignon actually had to be allocated on an account by account basis," according to Moak.

It was not Vichon's intent to increase production of Chevrignon, so how do you judge success of the promotion? "In terms of image enhancement," Moak adds, "the promotion was very successful. We want to keep Chevrignon the highest quality product, and to do that we need the best grapes; the best grapes cost more, so we want to get the best bottle price we can."

Demand was stimulated in the top 12 markets where the promotions occurred, bolstering the bottle price. "Before the promotion, Chevrignon typically sold for \$7.99 retail," adds Moak. "Now it typically sells for \$9.99 to \$10.99. There's less need to discount." The average price has risen \$14 per case FOB net of programming, from \$54 to \$68. "We've also been able to place the wine in better restaurants and better by-the-glass programs." ■

What are grape flavors for?

What a strange and esoteric question. We all know what grapevines produce fruit flavors for — to make wine taste nice, that's what for! Flavors are due to volatile chemicals in the berry and are an important source of aroma and flavor in wine.

However, it is interesting to think about grape flavors in a wider, biological perspective. What were the evolutionary advantages of grapes producing flavored berries? Some answers to this question can be found in a scientific paper published in the *Australian Journal of Botany* in 1988. It is entitled "Considerations of some volatile constituents of grape (*Vitis* spp)" by W. Hardie and T. O'Brien. The paper also speculates on the role of acidity, berry color, and seed tannins.

Most attributes of biological organisms have some sort of evolutionary purpose. If we understand what the biological imperative is, we may be able to manipulate our vineyard to improve these attributes, be they in yield or fruit composition.

For example, I often use the illustration of primitive grapevine seedlings struggling to grow through the shade of a forest canopy to reach sunlight at the top. To save energy, the little plant will climb, using other plants for support — using thin, non-supporting trunks and grasping tendrils on the shoots. When the plant reaches the top of the canopy, it can begin fruiting. Understanding this basic idea, you can appreciate an important principle of canopy management — how sunlight can switch vines from a vegetative growth (or climbing) phase to one of fruiting.

Dispersal means survival

Volatile flavor compounds are termed secondary metabolites, and their adaptive value seems to be in their ecological interactions with other plants, animals, or the physical environment. The genes responsible for these constituents in present-day cultivars were apparently a result of selection pressures and mutations that existed prior to domestication, which occurred only about 6,000 years ago.

Grapevines are believed to have evolved in the Tertiary period, about 30 to 60 million years ago. For this very long period of time, reproduction would have been essentially sexual, with the attendant higher rate of mutation expression.

Since their selection from the wild by man, propagation of grapevines has been largely from cuttings, so that any recent evolutionary changes are due to somatic mutation, which occurs at a much lesser rate than changes which occur with sexual reproduction. Hardie and O'Brien claim that the volatile flavor compounds which produce the wine flavor we admire so much may be the products of selection pressures which no longer exist.

Birds are the animals primarily responsible for dispersal of grapes, but also mammals and reptiles. Present-day species known to be effective in dispersing grapevines include birds, red foxes, black bears, and the box turtle.

I remember when I owned a vineyard in Australia how foxes used to visit the vineyard at night. They particularly liked to eat the muscat-flavored Frontignan grapes, and I found seeds scattered in their feces around the vineyard.

In the pre-Cretaceous era, before birds and mammals



by Dr. Richard Smart

evolved, reptiles were important agents of plant dispersal. Modern reptiles have a keen sense of sight especially in the orange/red range; primitive grapes are known to have pigmented berries. Many present-day white grapevine varieties are thought to be relatively recent adaptation, the result of man's selecting mutant forms of wild grapes.

In the Cretaceous period, birds evolved and offered primitive plants a new mode of seed dispersal to widely scattered sites. In turn, this led to a selection pressure for insect-mediated pollination, which is more effective for widely scattered plants than pollination by wind alone.

We should remember that primitive grapevines were monoecious; that is they were single sex, either male or female. Pollen transfer from male to female was thus an all important issue. Today's varieties are dioecious; that is they contain both male and female parts and so are largely self-pollinated. This again is thought to be the result of a selection pressure imposed by humans during domestication.

Plants that have seeds dispersed by birds have many features in common. Their fruits have a visually attractive and edible part. A change in skin color signals ripeness. The flesh is not appealing before ripeness due to high acidity, and the seeds are hard and rich in astringent tannins.

Because birds are not likely to be attracted by aromas, it is presumed that the volatile flavor constituents are not important for this function.

So the die that produced the modern grape berry was cast in primitive times. It became colored to attract birds and reptiles, contained tannins as a defense against grazing animals and to protect the seed against chewing. The berry grew fleshy to attract birds, and emitted odors which attracted insects during flowering.

Have you ever noticed the scent in a flowering vineyard? I notice it particularly for Shiraz (Syrah), but many varieties produce it. There are odor glands at the base of the flower which produce this scent. In Hebrew the perfume is known as *smadar*, which is used as a brand name for a wine in modern Israel. Some old Eastern authorities claimed the scent is an aphrodisiac, and there was apparently a vigorous trade in dried grape flowers as a result.

Hardie and O'Brien postulate that there may be some link between the scent at flowering and subsequent flavor development in the berry flesh. This proposal is obviously an opportunity for biochemical research and perhaps marketing initiatives.

Grape volatiles and their possible evolutionary role

Terpenes are hydrocarbon compounds with 10, 13, or 15 carbon atoms. One group, the monoterpenes, are important flavor compounds for Muscat grapes, and for Riesling and Traminer. These compounds impart floral-type aromas to the fruit and the resulting wine. The monoterpene compound damascenone is an important flavor compound for the American species *Vitis labruscana*.

Monoterpenes occur in grapes as free-form volatiles, or as non-volatile disaccharide glycosides. These bound forms can be split by acid hydrolysis, which makes them volatile. Monoterpenes are at the highest concentrations at fruit set and decline towards veraison, rising again during sugar accu-

mulation and peaking in over-ripe fruit.

Why this strange pattern? Hardie and O'Brien suggest that the initial peak of concentration is related to attracting insects for pollination. Insects are known to occur in modern vineyards at flowering although as discussed in Winkler's textbook they are not thought to be necessary for pollinating modern varieties because they are dioecious. The second peak, which occurs in the over-ripe berry, is thought related to secondary dispersal. In other words, these compounds may attract animals which can move the seed around on the ground. Perhaps also these compounds may promote the success of the germinating seed.

In other plant species, terpenes have been found to possess the following roles: They attract insect pollinators and also inhibit oviposition. They repel insects, fungi, browsing animals, and microorganisms. Last but not least, terpenes may act as phytotoxins to inhibit germination and growth of competitive plants.

Terpenes similar to those found in the fruit are also found in young grapevine leaves. Many species, including ants, use terpenes as alarm signals and repellents against other insects; thus terpenes may have a role in protecting grapevine foliage against insect grazing.

During passage of the berry through the very acid gut of a bird, glycosides are hydrolyzed to volatile terpenes. Perhaps the aroma of the fecal pellet can act as attractants of

secondary agents of dispersal (e.g. ants), as repellents of predators (e.g. arthropods or microorganisms), or even as germination inhibitors of competitive plant species.

The ester of methyl anthranilic acid is specifically associated with the American species *V. labruscana* and its hybrids and is an important contributor to the so-called foxy aroma. This compound commences accumulation in the berry at veraison and peaks around maturity.

This compound and its chemical relatives are known for diverse biological activity, including growth retardation in grasses, frost resistance, and herbicidal activity against a variety of species. Hardie and O'Brien also postulate a role for methyl anthranilate in combating powdery and downy mildews, which seems an interesting area for future research.

Pyrazines are nitrogen-containing compounds probably derived from amino acids. The compound 2-methoxy-3-isobutylpyrazine is considered responsible for the vegetative or bell pepper flavor of Cabernet Sauvignon and Sauvignon Blanc. It is present in a wide range of plant species including spinach, lettuce, greenpea, French bean, broad bean, Chili pepper, sweet pepper, and others.

The **methoxypyrazines** probably have a biological role as attractants or repellents of insects. For example, the Argentine ant has been shown to expel volatile secretions of pyrazines. Alkylpyrazines have also been found to occur as alarm/defense mechanisms of other ants and to be present in



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the trail-marking pheromones of leaf-cutting ants.

Methoxypyrazines are found in their highest concentrations in fruit tissue, and so a role of protecting the fruit and developing seed against insect damage seems most likely. Since these compounds are common in the group of varieties arising in central, western, and southern France, some interaction with local insect fauna might have occurred.

Conclusion

For the moment, these studies have raised more questions than they have answered. There does seem to be circumstantial evidence that some flavor compounds and other chemical constituents in grapes had important biological functions associated with the reproduction of the species before domestication by man.

We do know that flavor compounds can be manipulated by vineyard management. For example, the methoxypyrazine compounds responsible for herbaceous characters in Sauvignon Blanc are enhanced by shading. The biological significance of this for dispersion or survival is difficult to say.

Studies such as the one reported here can only help our understanding of how to improve the management of grape flavors in the vineyard. For the moment however, we can conclude that much remains to be learned from this evolutionary pressure consideration of grapevine physiology. Somehow it does seem to demean wine to think that an essential feature — grape flavor — might be designed to attract or even repel insects!

Dr. Richard Smart, "the flying vine-doctor" is an international viticultural consultant. He can be contacted in Australia by fax on 011-61-65-84-0121 or by e-mail on smartvit@midcoast.com.au. He visits America frequently and can be reached through Vinquiry in Healdsburg, CA. Phone 707/433-8875.

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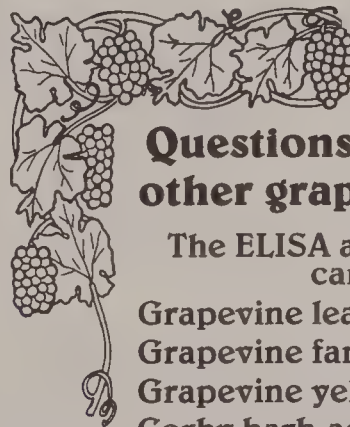
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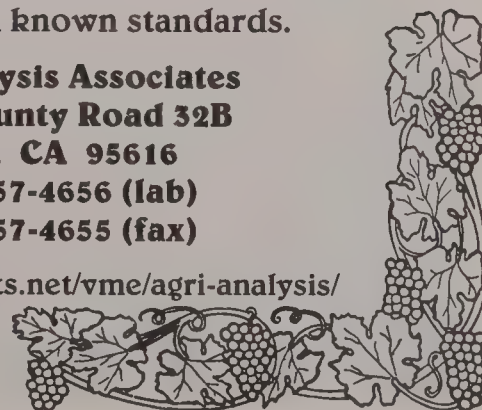
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Further thoughts on Resale price maintenance

One of the things I enjoy about antitrust law is the complex relationship among common sense, the law as most attorneys describe it, and the law as it may be developing.

Take a recurring situation in the packaged consumer goods business: How can a brand owner prevent a distributor from pricing above the target price point?

The common sense answer is to come to an understanding with the distributor, using carrots, sticks, or both to bring about the desired price behavior.

The standard lawyer response is to exclaim (perhaps with some arm-waving), "You can't do anything of the kind!" Conventional advice is to stay strictly away from any agreement with, or coercion of, the distributor to maintain your desired pricing downstream because under antitrust law that's illegal — big time. In that analysis, a "vertical" agreement on prices between a winery and a wholesaler is plain old price-fixing, subject to the same harsh penalties as a pricing agreement with another winery — felony criminal charges and triple damages in civil suits.

Thus, (the mainstream viewpoint goes) you have to communicate with wholesaling customers in a way that leaves distributor management convinced of the wisdom of your price recommendations and intending to follow them, but *not* (heaven forbid) agreeing to do so. That is the kind of distinction that causes field sales people to tune out of legal compliance programs. It also leads to reams of lawyer-created paper purporting to record events that simply don't play that way in the real world. Nevertheless, the fears behind the conventional approach are well-supported in the most recent pronouncements of the courts.

Risks and rewards

There is a third perspective, one that some consider cutting edge in antitrust compliance circles. Unfortunately, the difference between the cutting edge and the bleeding edge is not great in antitrust law, so a more aggressive analysis is definitely not for the risk-averse. Nevertheless, it is worth discussing with your legal advisor if resale price maintenance, or the lack of it, is a headache for your marketing planners. Understanding the pros and cons of going beyond conventional antitrust wisdom is part of knowing the legal environment in which wineries operate.

As a framework for discussion, and definitely not as a legal prescription, consider the following routes to downstream price control:

Selling directly to the retailer. "Wait a minute," anyone familiar with the industry will say. "Virtually every state has a three-tier system that requires suppliers to sell through wholesalers. And who's going to service the market if I sell direct?"

Absolutely right. To comply with liquor laws, the goods have to be sold first to a wholesale licensee. Some states say right in the statute that the wine has to go physically to the wholesaler's warehouse and be added to inventory. Even

without that kind of state law, it usually wouldn't make business sense to try to go around the distributor.

What we're trying to accomplish here is to differentiate the antitrust substance from the liquor law formalities. Assume for the sake of argument that the distributor will be happy with any paper trail so long as the economics and the in-the-street reality are unchanged. Now if it weren't for the liquor laws, you could simply consign the goods to the distributor, pay for the insurance on them, and pay the distributor a commission on sale.

In that case the distributor would be your agent, and the ownership of the goods would pass directly from you to the retailer. It's your sale, so you could price the goods however you wanted. The rest of the scenario is the same as usual: The distributor still does all the selling, delivering, in-store service, *etc.*, you are accustomed to.

The aggressive antitrust position would be that if you could in *reality* assume all the risks of a company-run distributorship (including subjecting yourself to local taxation) and make the distributor *in effect* a commission agent, you could enter into an agreement with your agent to comply with the formalistic requirements of liquor law regarding passage of title and how the invoices have to be worded and still call the shots on price to the retailer. You would have a felony on paper (because the invoices show sale of the goods to an independent business), but a legal arrangement in reality, *assuming* all courts will look at the reality instead of the form (as the Supreme Court says they should for federal antitrust law). Among the factors going into a decision whether to bet on that assumption are risk-reward analysis (with particular attention to the state antitrust laws involved) and the personal philosophies of attorney and client.

Paying the distributor to accept price recommendations. This looks a lot like the common-sense carrot approach.

Logically, if (as the Supreme Court continues to maintain) vertical price fixing agreements are analytically the same as horizontal (*i.e.*, competitor-to-competitor) ones, paying the customer to agree is a ticket to San Quentin.

The reason it's possible even to talk about the possibility is that all the courts *don't really* follow the same rules for vertical and horizontal price-fixing, because anyone can see that vertical arrangements are not the same from an economic standpoint. Granted, the law as enunciated by the Supreme Court won't let judges treat vertical price fixing as okay; nevertheless some lower courts have established different standards of proof that make it more difficult to challenge a purely vertical arrangement. That provides just enough wiggle room for a possible end-run.

The most popular end-run is the cooperative advertising program that requires advertising the recommended price. Participation in program is strictly voluntary. Distributors are free to charge whatever they want to charge, but if the price to the retailer is different from the brand owner's recommendation they don't get the co-op ad money.

Tell the distributor you'll pull the brand unless the dictated pricing is followed. Oddly enough, this common sense "stick" approach is the one of the three food-for-thought options we're looking at that is expressly endorsed by the Supreme Court, and the one I like least.

The system has a name: a Colgate program. It's named after an early federal antitrust case that says in effect that there is no *agreement* involved in a brand owner's unilaterally adopting a policy to deal only with wholesalers who follow the official pricing, announcing it in advance, then unilaterally discontinuing sales to those who don't comply.

To some that might seem coercive, but it is justified by the importance of freedom of contract or, more specifically, the right to choose one's customers. As a matter of public policy, exercise of that right of choice, without a price agreement, is not considered illegal coercion under the federal Sherman Act.

Why don't I like it? Because in the real world it hardly ever works according to theory. (We'll leave aside the fact that a Colgate program isn't an option in a substantial number of states with so-called franchise laws limiting the circumstances under which a supplier can stop supplying and is questionable in another group of states that may not regard the Colgate case as applicable to their state antitrust laws.)

The natural tendency is not simply to cut off a distributor who doesn't follow the price instructions, but rather to accept the distributor's assurances that it won't happen again. Bingo, an agreement. One federal court came out and said

Continued on page 80

Late-breaking development in pricing

A Connecticut court recently ruled that a conventional depletion allowance system violates price posting.

It was, unfortunately, not a surprising decision, as administrative agencies have often said the same thing. The simple (not to say simple-minded) logic of the ruling is that because price-posting laws require that the selling price be stated in advance and that sales all be at that price, and the purpose and effect is to prevent price competition in the market, then if a supplier makes post-sale allowances based on distributor performance that have the same effect as a price reduction and would re-introduce competition, then the supplier will be deemed to have sold at a lower price than the one it actually charged. Otherwise, the regulators argue, the rule would not accomplish its purpose.

It doesn't have to be that way, even in a price-posting state. Price-posting laws are generally silent on the question of allowances calculated after the sale takes place, leaving room for interpretation. A pro-competitive court would say to the rule-makers that if a winery makes the sale in conformity with the rules and later adopts a common, legitimate business practice that renders the rule ineffective, then you should write a different rule if you want to cite the winery for a violation.

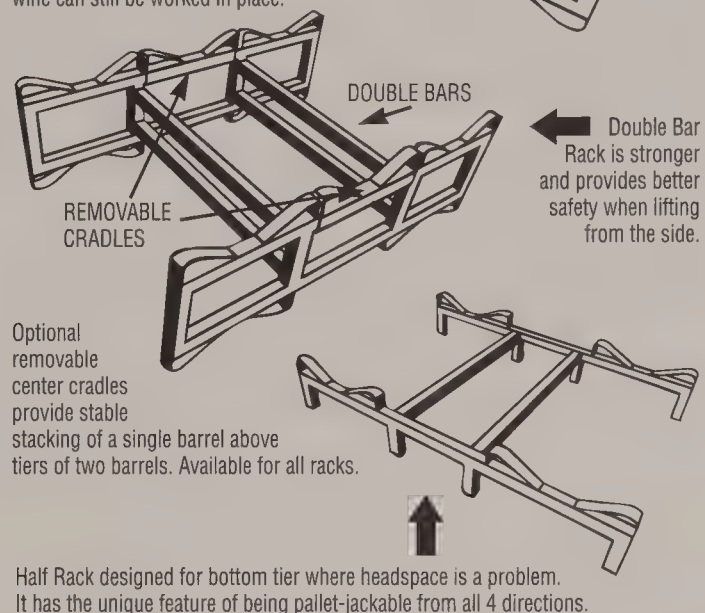
Philosophy aside, the practical lesson is that post-sale incentives should not be so many cents per case purchased. If the incentive, such as a cooperative advertising payment, can't be applied arithmetically to result in a retroactively lowered selling price, then the likelihood of a price-posting violation is substantially reduced. ■

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that Colgate requires such "Doric simplicity" that it is scarcely conceivable it could work in the real world.

To be sure, there may be numerous Colgate programs that are working just fine that I never hear of precisely because they don't get in trouble. It's true that lawyers tend to learn about the ones that produce judicial opinions or end up in negotiated consent decrees.

Still, in over 25 years of schmoozing with my antitrust compliance colleagues, I've yet to come across anyone reporting a long-term success with Colgate, and scarcely a year goes by without the news of some company paying a fine and accepting an injunction because the theory simply wouldn't play in practice.

Nonetheless, in recent years the cutting edge has questioned whether the degree of simplicity really has to be Doric. One current theory is that "termination in stages" would get around the no-renting dilemma. Under that system, the policy would be that the first price infraction creates kind of probation, with the possibility of more than one strike before you're out. Another theoretical variant is to limit sales to wholesalers who hit the recommended price in a predetermined percentage of sales.

So far as I know there are no judicial opinions yet on whether a well-run Colgate program using one of the current theories would pass muster. Reports continue of consent decrees in cases where the program went awry. Meanwhile, even the cutting edge theorists are unsure of basic issues such as when, if ever, the winery could resume selling to a distributor after stopping sales in response to improper pricing.

Bottom lines

Remember that except in those areas, if any, where you and your legal advisor have put together a more aggressive program, it is still important to be conservative about price communications to your customers. However, even with an across-the-board prudent approach, your discussions should take into account that many cautious programs contain the following two exceptions to the hands-off-resale-prices rule:

- You can require the distributor to *tell you* what he or she is selling the wine for or even to provide copies of invoices to retailers, so long as getting that information is not part of a coercive course of conduct.

- You can present the reasoning in favor of your recommended price, even argumentatively, if there is no coercion.

In this context you need a practical understanding of what constitutes coercion. Although it's a context-sensitive determination, you can assume that high-handed conduct like delaying order processing or denying benefits available to other dealers is a bad idea. Often written communication is needed to avert arguments later about exactly what was said in support of the desired pricing.

In summary, resale price maintenance is a natural feature of brand name packaged goods marketing that happens to be illegal in most circumstances because of what many observers (including judges) regard as an aberration in U.S. antitrust law. Federal judicial finagling provides some foothold for experimentation, but it is risky, especially in view of state law. Still, wineries should not suffer in the marketplace because of non-competitive pricing by wholesalers without at least looking at the options. ■

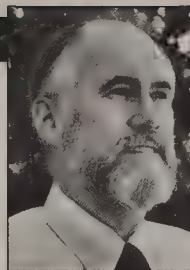
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Our encounter with the super-yeast occurred during the fermentation of two 1994 vintages — a late harvest Gewurztraminer and Zinfandel. Both grapes escaped bird predation and other late-season destructive vectors until the sugar content of both hovered at around 41° Brix. The yeast inoculation was routine, using Montrachet for the "Zin" and Prisse de Mousse for the "Gewurz."



Fermentation was slow during the late October and early November period.

Both wines reached what appeared to be a yeast to alcohol barrier at around 15.5% ethanol. After several rackings, the wines appeared to be stabilized until the summer of 1995, when they again exhibited a vigorous second (not ML) fermentation. Apparent end-point alcohols were 16% and 17%, respectively, for the Zinfandel and Gewurztraminer.

Alcohol concentrations of 21% have been reported for some yeast strains, but such conversions are apparently the exception.² Considering the denaturing of most yeast strain cell walls and interference with delicate yeast enzyme systems at or before maximum alcohol concentrations of around 17%, our super yeasts were operating near the limit of their abilities. They are the yeast equivalent of triathletes with incredible endurance and a seemingly abnormal power to perform.

Our vinification plan for a residually sweet late harvest style Zin and Gewurz was nearly thwarted by these aggressive fermenters. We stopped their binary fission and asexual reproduction with a blast of SO₂. If the wines had gone dry at around 22% alcohol, our olympic class yeasts would have gotten the gold medal in the special mutant event.

Winery fire protection systems revisited: Implications of the 1994 Uniform Fire Code

Part II

Part I of this two-part series (March/April, 1996) examined one of the major changes between the 1991 and 1994 editions of the Uniform Fire Code (UFC), i.e., rate and duration of fire flow for wineries. Part II highlights several other sections of the UFC revisions as they might affect winery construction and fire protection systems.

Surfing the UFC

The UFC authors have made it relatively easy for both design professionals and interested winery developers to identify code changes without resorting to a page-by-page comparison of the 1991 and 1994 editions. For the first time, the UFC is also on disk.

An IBM-compatible personal computer with 640K of RAM and seven megabytes of hard disk drive space will handle both Volumes I and II. Pages containing revisions will have a solid black vertical line opposite each paragraph or in some cases the entire section. Additionally, an alpha code of either a "B" or an "M" repeated vertically in the margin, identifies that the particular paragraph or section of the UFC has been modified or revised to reflect a change in the Uniform Building (B) or Uniform Mechanical Code (M).

For example, the so-called occupancy class for a winery structure must be determined from a scan of Section 216 of the UFC.³ The UFC clearly lists the proper category for wineries under Group "F", Division 1, Subcategory (6), **alcoholic beverage production**. (The page-margin alpha-code

indicates that the source of the occupancy classification is attributable to the Uniform Building Code [UBC].) Group "F", Division 1 occupancies are all classed in the **moderate hazard** industrial category. Thus, whenever other UFC sections report fire protection system design and performance requirements by occupancy class or hazard, the correct code stipulation for a winery will be easily observed for planning or design purposes.

Wineries generally warehouse at least a portion of their products, and that sector of the winery structure classified as **storage** has a different occupancy class than the strictly production or administrative spaces. A Group-5 occupancy — for example, Division 2, subcategory (1) — specifies a low-hazard category for the storage of beer or wine in either metal or glass containers.³

The latter category also includes the cartons and wooden pallets routinely used by the wine industry. Shrink-wrap film on the palletized wine, according to the UFC, does not change the low-hazard classification. Again, this revised section of the 1994 edition of the UFC is sourced to the UBC as the base reference for all matters pertaining to building occupancy and hazard classification. In this instance, the two codes do work compatibly to produce an unambiguous requirement to guide the building designer and fire protection engineer through the maze of fire safety regulations.

Winery refrigeration systems and fire safety

Provisions of UFC Article 63, Section 6301-6309, a new code section,³ specify certain limits for the mandating of access, electrical controls, and venting systems for so-called A-1 refrigerant capacities that exceed 220 pounds or 30 pounds of non-A-1 group refrigerants, such as ammonia. (The latter toxic refrigerant is making a return to the industrial refrigeration scene because of its zero ozone depletion potential — it does bring with it the additional hazard to building occupants and fire fighters, if safe handling of the

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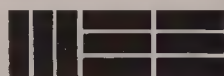
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A sampling of the UFC refrigeration system provisions is as follows:

UFC Section Partial description of ammonia system requirement

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| 6309 | • Ammonia refrigeration systems shall be provided with an emergency discharge into a tank of water that is to be provided exclusively for ammonia absorption. (One gallon of water is required for each 1-lb. of ammonia in the system.) |
| 6310 | • Separate refrigeration machinery rooms may be required under certain conditions. |
| 6310.4 | • Refrigerant-vapor detectors and alarms shall be required for refrigeration machinery rooms. |
| 6323 | • Refrigerant types shall not be changed without the approval of the fire chief. |

UFC needs to be reckoned with

Parts I and II of this series have only scratched the surface of the changes to the fire code. On the one hand those changes are good for wineries by making them less vulnerable to fires and damage, but at the same time, the more restrictive UFC can add an additional capital and operating cost component that wineries with tight profit margins may not be able to offset with fire insurance premium savings. ■ David Storm is a consulting civil and sanitary engineer specializing in winery utility systems and is the owner of Winters Winery.

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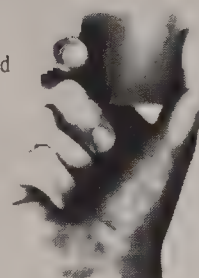
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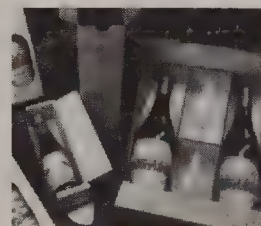
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Death threats

"Hello, is this Jake Lorenzo?"

I thought the voice sounded familiar. "Yeah, this is Jake Lorenzo. What can I do for you?"

"Mr. Lorenzo, this is Morley Safer. I think I have a little problem, and I'd like to hire you in your professional capacity to help solve it."

Safer was in San Francisco, CA, working on a *60 Minutes* story. He'd received a series of threatening notes. The notes had all been postmarked from Sonoma, CA. When I asked where he'd heard of Jake Lorenzo, he replied, "Why, from *Cold Surveillance*, you sent me a copy after I did my first piece."

I got his address and headed for San Francisco.

* * *

In person, Morley (as he likes to be called) has a hugable quality. All those deep furrowed wrinkles you see on television take on a bloodhound quality, but his eyes twinkle with spirit and good humor. We had the notes spread on the table between us. There were three of them. Each consisted of words and letters cut from magazines pasted onto plain, white paper.

The first note read, "Stop telling people wine is good for them or you die."

The second admonished, "Cancel all future positive wine stories, or you'll be in permanent re-runs."

"It's that last note that caused me to call, Jake. It looks like blood down at the bottom."

The last note threatened, "Stop touting wine, or your 60 minutes are up, you slime-sucking son of a bloodhound." There was a large, dried red spot at the bottom.

Morley was saying, "I'm a pretty visible person Jake. I'd prefer this not go public. I've no desire to be the subject of so exploitative a story. That's why I've opted for your services instead of going to the police."

I studied the spot of blood.

"I suppose it could be someone from the religious right," continued Morley, "some sort of off-kilter teetotaler."

I sniffed at the blood spot.

"What do you want me to do, Jake?" asked Morley. "I can arrange for protection if you think it's necessary."

I tasted the spot of blood.

That stopped him. "Good God, man! What on earth are you doing?"

"Mr. Safer," I said, "you don't need to worry about this. Just go about your business. You won't be getting any more threats. I can guarantee it. You see, I know who sent these notes."

* * *

A contrite Chuy poured a fresh cup of coffee, added the requisite shot of Hornitos, and stared morosely at the three notes on the counter. "How did you know it was me, Jake?"

I tapped the blood spot on the third note. "I'd know red chili sauce from The Burrito Palace anywhere, *carnal*."

"Well, how am I supposed to know that a big shot TV star like Morley Safer is pals with Jake Lorenzo?" asked Chuy, with more than a touch of indignation.

"Maybe other people don't know that I actually do detective work, Chuy, but you've got no excuse. We've even worked together on a few cases. Why'd you do it Chuy? What



the hell were you thinking?"

"Hell, Jake. You know me. I'm not serious about killing nobody, but somebody's got to do something. That Morley Safer and all his damn

reports on how wine makes you healthy is screwing things up for us common men. He's got people sucking down vino like it was Ponce de Leon's fountain of youth.

"He's created *un gran tornado* that is sucking up every damn bottle of red wine in this country. The wineries keep raising their prices to slow the flow, but it don't work. There's no juice, people are standing in line for what's left, and the prices have gone through the roof.

"I'm a working man, Jake. You don't get rich selling rice and beans to gringos. Where am I supposed to get \$20 to \$30 to pay for a bottle of red wine? Not only that, but the damn vino is being released too soon. It's full of new oak and young, green fruit. It's so soft and ready to drink, I get nervous that it will die before I empty my glass. I'm telling you, Jake lots of people are going to be *mucho* disappointed in a few years when they taste some of this stuff they're putting into their cellars."

Chuy does have a point. I don't know that it's so directly linked to Morley Safer, but wine has become scarce and prices have become ridiculous. I was up in Washington last week. Washington wines have always amazed me. Except for a few of the larger wineries, you rarely see them in other parts of the U.S. But in Washington, the wines are everywhere. Restaurants, wine shops, people's homes, Washington wines are the rage. Not just any Washington wine but the "right ones." The wines nobody can find. The ones that cost a fortune.

Washingtonians are in a frenzy to buy these wines. One famous winery had just released its 1994 Merlot. It was priced at more than \$40 per bottle. The store owner was limiting his customers to one bottle each, and they had to pick it up that very week. Give me a break. I tasted that famous \$40 bottle of wine. There was one thing that was spectacular about it: How did they get *all that oak* into a 1994 Merlot and *still* have the wine in the store within 17 months?

Jake Lorenzo is not picking on Washington. All across the country, people are waiting in line to buy all kinds of high-priced wines, especially if some magazine scores them at 90 or above. If it says "Merlot" on the label, people will buy it, no matter what the cost or the taste. Wineries are out of stock. They're raising prices higher than the national debt.

They're ageing, bottling, and shipping wines faster than Marvin Shanken can light a cigar. The French, Italians, and Spanish are all raising prices to keep up. It makes a wine-drinking detective wonder if the country has gone mad.

To Jake Lorenzo, this whole wine frenzy is like the Emperor's new clothes. You remember the story of an Emperor who hired a tailor. The tailor was to make a robe for the Emperor to wear at a big parade, only it was a scam. (Private eyes always recognize a scam.) There was no robe, but everyone was afraid to tell the Emperor that they couldn't see it. So the Emperor rode in the parade buck naked, and people all said what a fine robe it was. Finally, some kid shouted out, "Hey, the Emperor's naked," and the spell was broken. People started laughing at the Emperor, and his highness was mightily embarrassed. (I doubt the tailor got much more work, but I hear he retired in Chile where wine was cheap.)

It's pretty much the same with this wine frenzy. All these

IN THE CELLAR

kings are talking about the beautiful stuff in the bottle. The people come to the parade and plunk down princely sums to buy these wines. When they drink many of them, they find them lacking, naked of flavor and finesse. Afraid to admit they can't see the robe, they say, "This is fantastic. What wonderful wine. I'm so lucky to have it at any price."

Where's that little kid? Who's going to step up and say the bottle is empty? Don't make Jake do it. Not again.

* * *

Chuy stares at the notes on the counter. He shakes his head. "It's dumb Jake, I can't believe I sent these."

"It's OK Chuy, at least when you called him a 'slime-sucking son of a bloodhound' it had a beautiful alliterative quality," I said, trying to cheer him up.

"We've got to do something, Jake. If we don't slow down all these wine sales, we won't have no vino for ourselves."

"Don't worry, *carnal*, Jake is on the case." I reach into my pocket and pull out a press release. Chuy reads it, starts laughing, and brings me a free beer. "Lunch is on me, Jake," he says and walks into the kitchen still chuckling.

I look down at the press release sitting on the counter next to Chuy's three notes.

Wine may decrease sex drive

Dr. Iggy Calamari, inventor of the wine-powered pace-maker, has just released a report to *The Journal of Medicine* describing a three-year study which shows regular consumption of wine may slow down the normal sex drive in both men and women. As little as one or two glasses of wine a day has been found to reduce sexual desire by more than 65%. "It seems to be a delayed reaction, and doesn't show up for the first six to eight months of regular wine consumption," says Dr. Calamari. "We must always remember that beneficial effects of certain agents can be offset by negative side effects." ■

LETTERS

Dear PWV:

To Jake Lorenzo in March/April '96-PWV: Does Jake have a clue? I guess he hasn't seen or tasted the improvements to yield and quality that canopy management can make on moderate and high vigor sites. Besides, who can afford to buy wines made on low vigor 1-ton/acre sites? Who is he kidding? Properly handled, every viticultural technique he bashes can be used to improve quality.

Sincerely,

Ike Kerschner

Mica Ridge Vineyard

Coatesville, PA

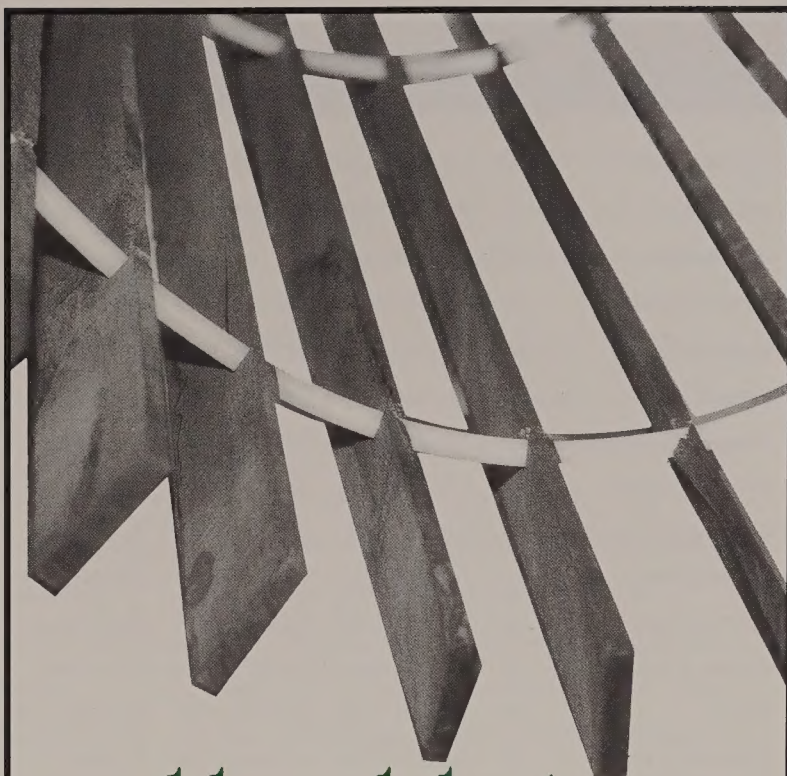
Dear Jake Lorenzo:

I agree on your Greed article. I am opening a wine bar and restaurant in Boulder, CO. The name will be Trios. I would like to have some of the small but great wineries represented. I have to sell Kendall-Jackson but if you could drop me a note on some of your ideas I would appreciate it.

Brion Wise

Denver, CO

Letters continued on page 86



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LETTERS continued

Dear Editor:

Shame on PWV! The "In the Cellar with Jake Lorenzo" column in the March/April '96-PWV wasn't funny, doesn't provoke constructive controversy or challenge intelligent opinion and, most importantly, does not state the true facts except in some "exception to the rule" cases.

The premium wines of Sonoma and northern California have reached their current high quality levels on the back of continually improving technology both in the vineyards and in the wineries. Our work in the vineyards of 1996 represent thoughtful globally researched viticulture and renewed environmental sensitivity and good business.

The primary shame of the 1990s wine boom is that some of the old time farm families of the 1960s and their children now work for someone else. They were good farmers in 1960 and they are good farmers and vintners now. They lost their land because they were poor businessmen in the 1960s.

The wines of Sonoma, Napa, and Mendocino are better than they ever were in the past and they will get better. The growers and vintners are spending vast sums of money, working hard at their jobs, worrying about how to produce the best quality grapes in the world on a consistent basis and taking significant risk all with the purpose of making California wines the best in the world — and profiting from that effort so that grape vines don't turn into condominiums — and we are succeeding by most accounts.

We are working hard for a worthy goal. We don't need the like of Jake Lorenzo and his unprofessional and asinine, confrontational remarks in a quality publication like PWV.

Sincerely,

Andy Beckstoffer, grapegrower
St. Helena, CA

THINNING continued from page 34

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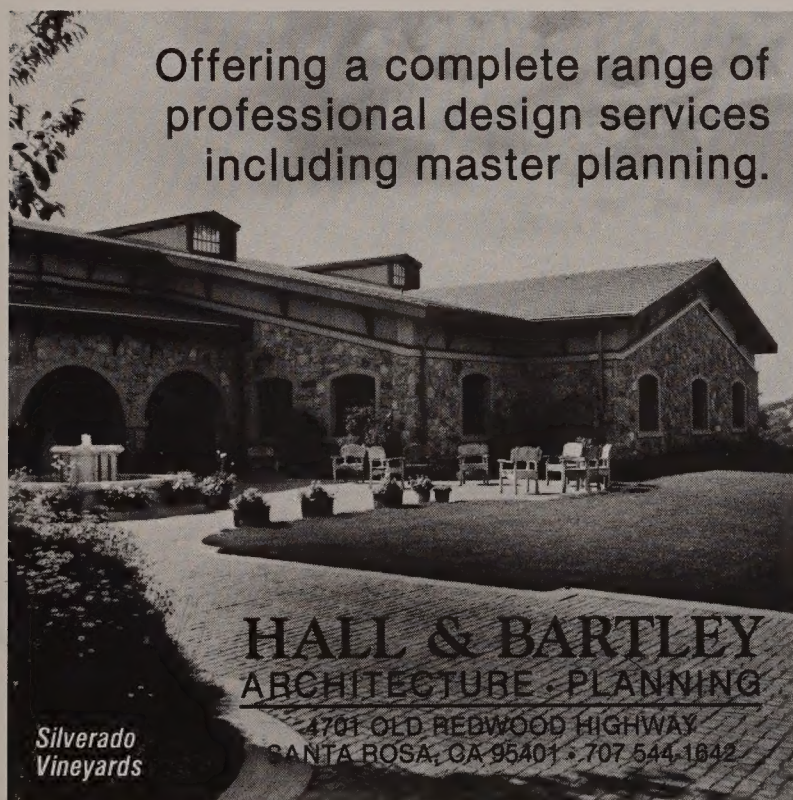
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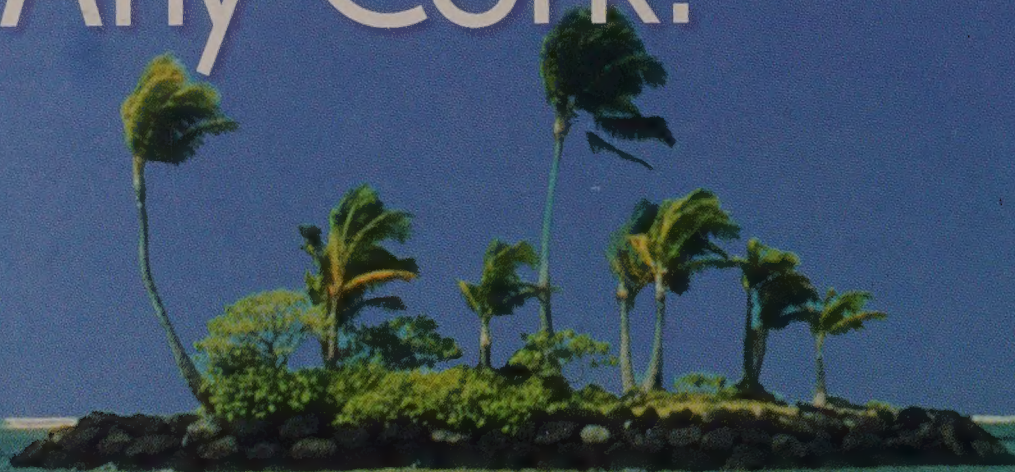
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